Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

Vol. 246. 97th Year. LONDON, SEPTEMBER 12, 1945. No. 4295. Price 1/-

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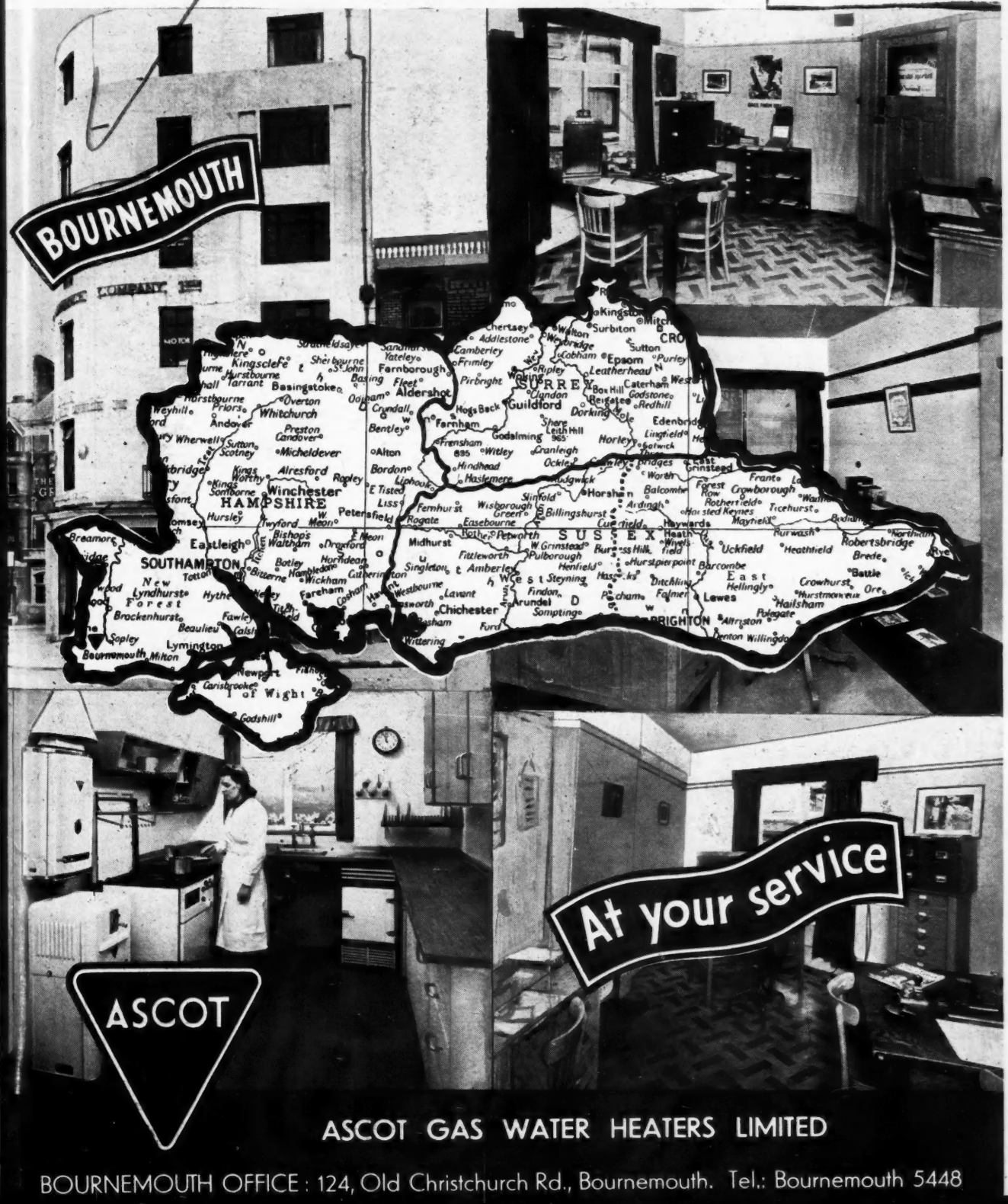
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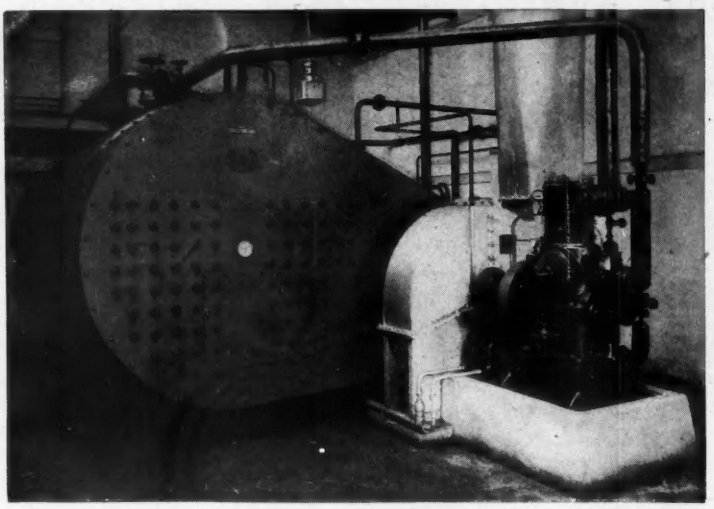

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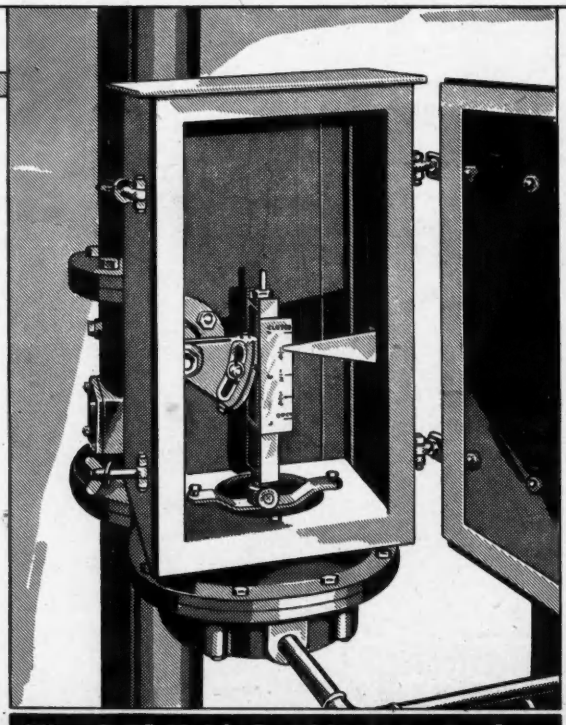

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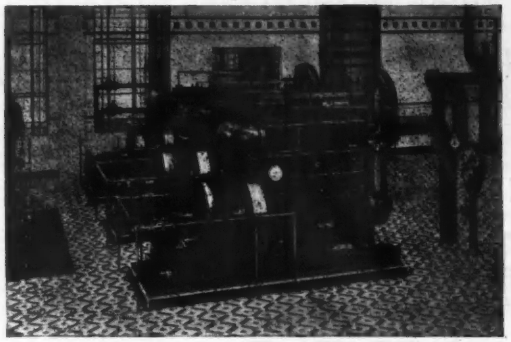

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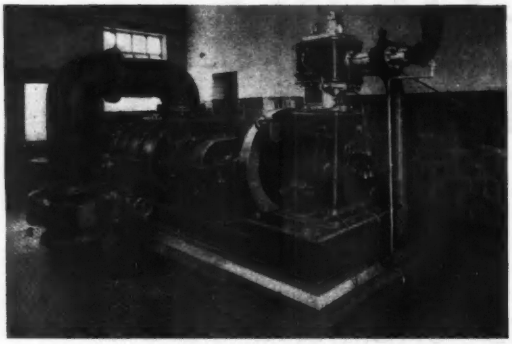

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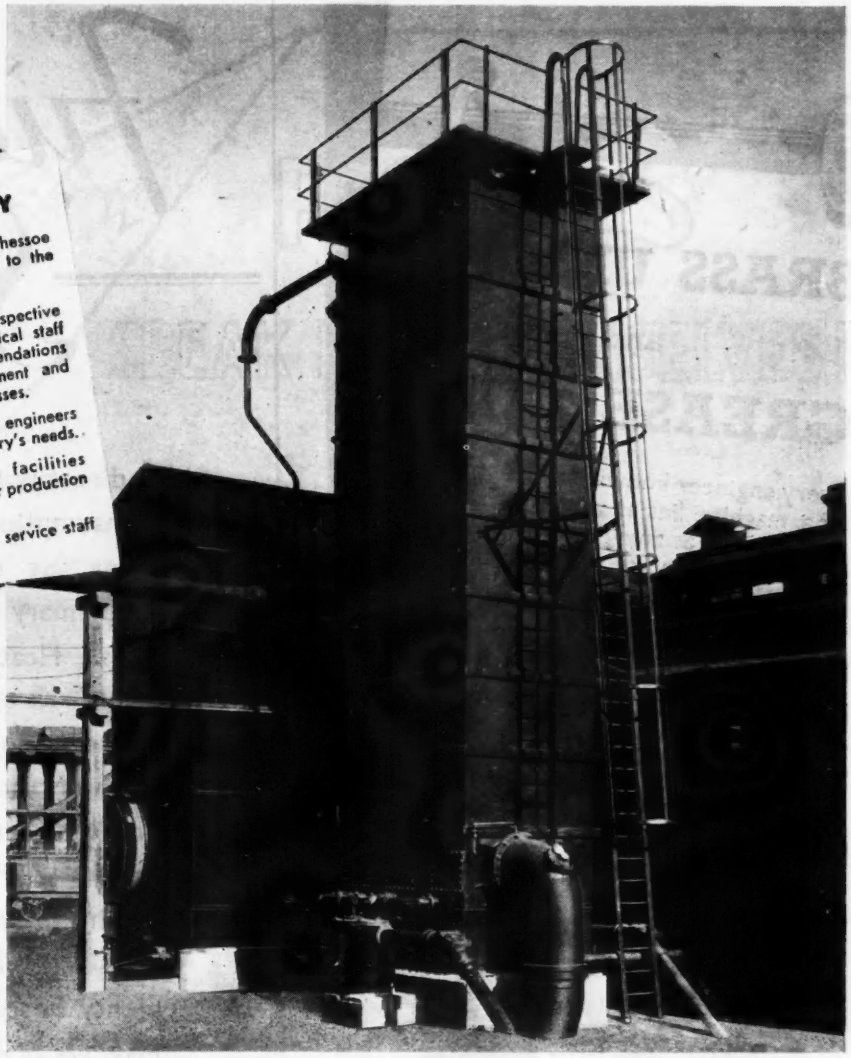

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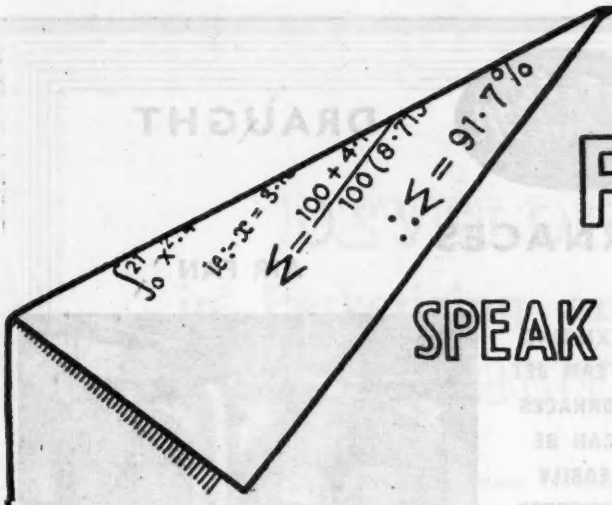

FIGURES SPEAK FOR THEMSELVES!

Very true, so they do, but so, for that matter, do certain politicians, and whenever anyone or anything speaks for itself the wise man is cautious. The facts may be true but the interpretation often puts things in another light.

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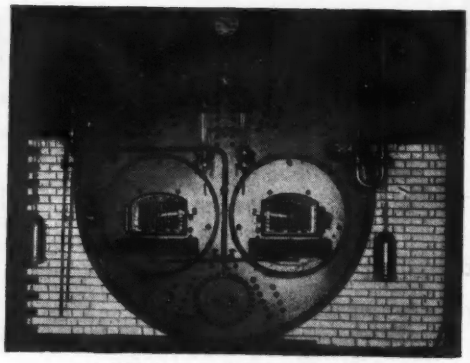

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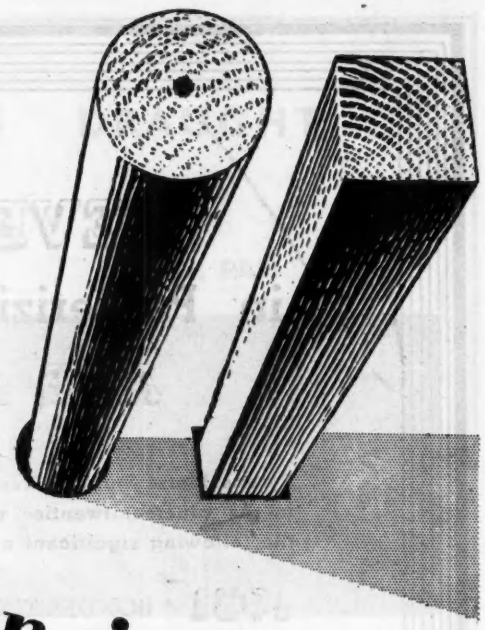

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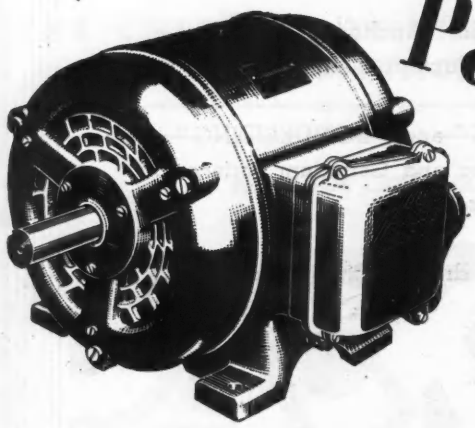

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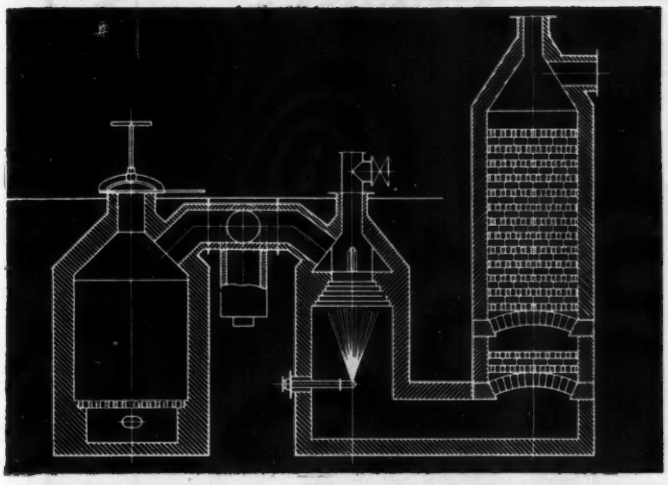

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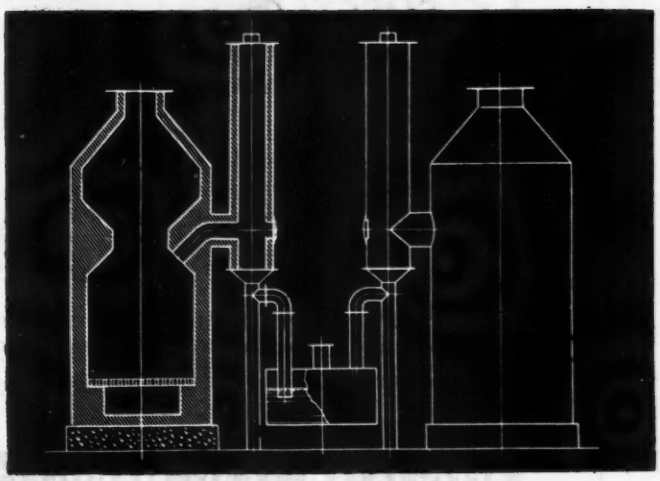

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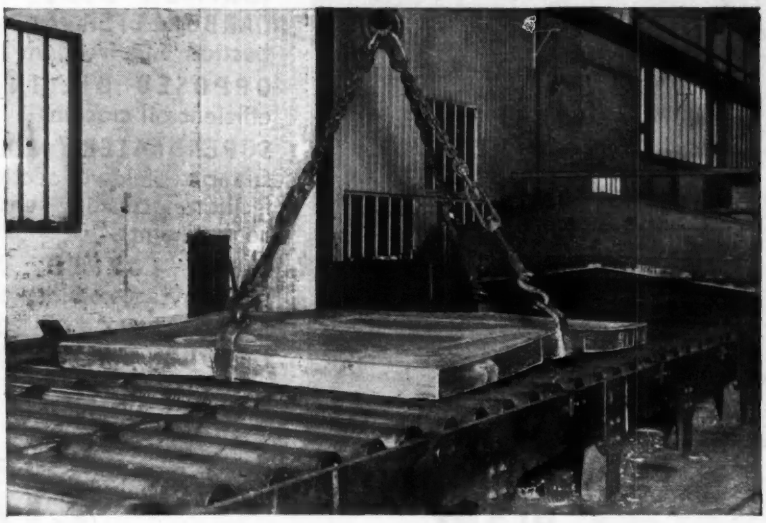

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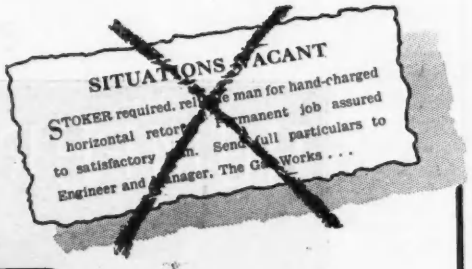
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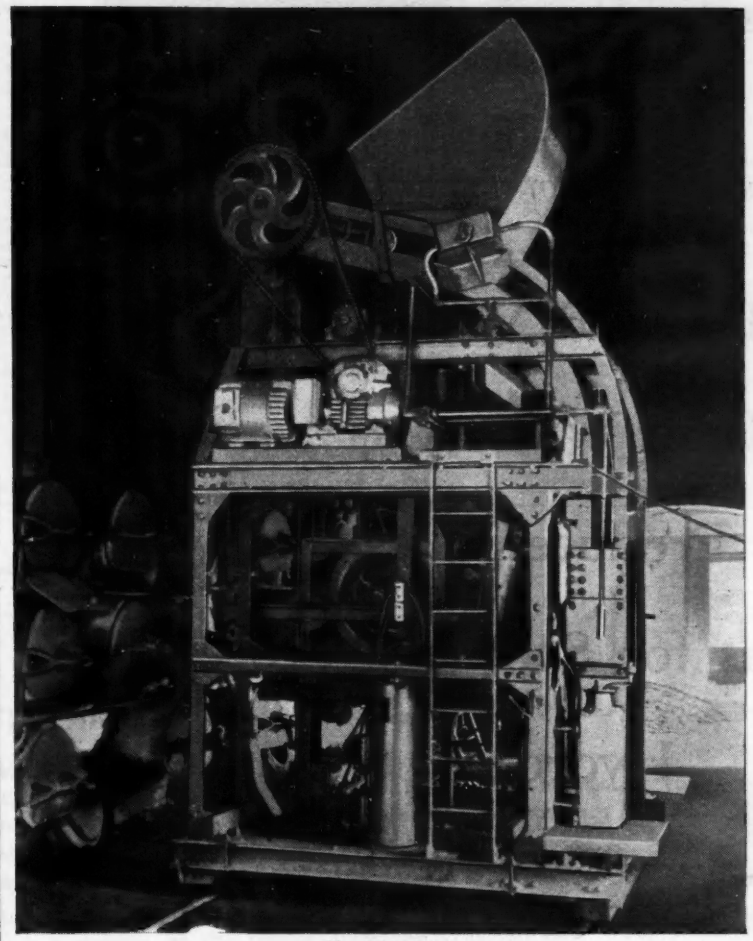

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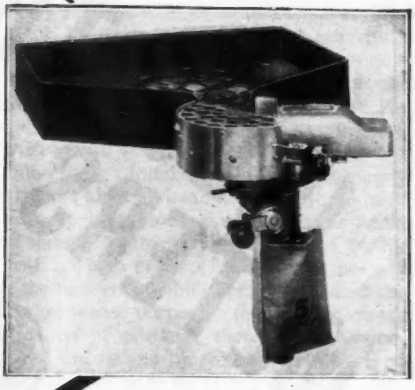

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GAS JOURNAL, SEPT. 12, 1945

VOL. 246 97th YEAR No. 4295

EDITORIAL NOTES

RESEARCH AND REVENUE

IN our issue to-day we publish the William Young Memorial Lecture delivered on Friday last by Dr. E. W. Smith to the North British Association of Gas Managers—the second occasion on which Dr. Smith has been invited to give this Lecture. The Author chose as his discourse a discussion on whether research has "paid" in the Gas Industry—a subject brought forward at the annual meeting of the Institution of Gas Engineers during "question time". We suppose the Gas Industry now believes that without research—pure and fundamental, and also hundrum investigation which provokes criticism yet requires finance—it would be by no means where it is. To some extent the Industry, *qua* Gas Industry, has relied on others to take the lead in the matter of putting at the disposal of the "back-room boys"—professors, doctors of science, and so on—adequate funds at any rate until comparatively recently. We realize that the Industry was largely responsible for the founding of the Livesey Professorship at Leeds; we know full well that it backed up from the beginning the work of the State-aided organization dealing with refractories; we know, too, of the positive antagonism which met new thought culled from the universities between 1920 and 1925. A change of heart is to be discerned, however.

Has research "paid" in the Gas Industry? Encompassed by competition the manufacturers of plant and appliances realized that unless they offered reasonable salaries to the purveyors of new thought, they would suffer accordingly. Between 1920 and 1925—and before this period—the plant and appliance makers reaped great benefit from their common-sense attitude, and many bright brains were attracted in the directions where they thought—and as events proved, rightly—that their energy would meet with appreciation. The manufacturers of plant and appliances, stimulated by competition, provided incentive to the research worker, and that incentive was not merely in terms of the pay packet, though obviously the pay packet helped. Even research workers are human. Certain gas undertakings had for some time conducted research and investigation. In the common interest they defined their research policy more clearly, decided to spend more on what this policy entailed and involved, and became less insular and less secretive. These all too isolated moves had their immediate and also more far reaching effects. We ourselves believe that co-operation between the several groups of research in the composite Gas Industry of to-day, a composite of Industry research, individual gas undertaking research, gas plant and appliance makers' research, was never greater, and that again it is towards common benefit and the fulfilment of the overall aim of better service to the consumer.

Does Gas Industry research pay? Has it paid in the past? Taken as a whole, the Gas Industry of this country has never felt sufficiently the spur of necessity. It has been aided enormously, as Dr. Smith indicated in his Lecture, by research work extraneous to itself. And here we may well quote this from the William Young Memorial Lecture: "By no means is the harvest always reaped by the sower, and least of all when the seed is represented by the labours of research workers. In the long run, however, these diverse labours advance progress in a kind of benignant circle—one man's restricted labours in his own interest opening up new fields to a neighbour, and all in unison, tending to the advance of our civilization." Naturally we refuse to commit ourselves regarding whether or not scientific probing has led to ethical advance, whether or not the scientific progress of mankind is a myth. The urge is there; that at least is fundamental. And what is the comparative measure of Gas Industry research urge? Eliminating the amount spent by individual gas undertakings and by the "contracting side" in 1905, expenditure, official Gas Industry expenditure, on research in that year, Dr. Smith stated, was £55; in the following year it was £53. In 1905 the Institution of Gas Engineers' contribution to research worked out at about 0.00002d. per therm. The comparative figure for 1944 (I.G.E. and Gas Research Board and the income-tax payer) was 0.004d. per therm of gas made. To what extent has the development of the petroleum oil industry been due to a more generous interpretation of what should be spent on research and investigation. Has the petroleum oil industry benefited from research? This is one isolated example. Will research "pay" the Gas Industry? Our answer is that the Industry will not live without constant research into its own problems, and without taking the best advantage from the researches of other organizations, researches pure and applied. The cost of a non-research policy would be as costly as the decision to adopt such a policy would be grotesque.

METHANE AND TOWN GAS

THERE has lately been published by the Institute of Fuel an important Paper by Sir A. C. Egerton and M. Pearce on the significance of liquid methane as a fuel (August issue of the Institute's *Journal*). It is a review of a field of investigation with which the Department of Chemical Engineering at the Imperial College has been concerned during the past six years, and in which the Gas Research Board has been interested not only theoretically, but in a most practical way. Naturally that section of the Paper dealing with liquid methane in relation to town gas has to us primary appeal. As is pointed out, the extraction of methane from town gas could only be an adjunct to the activities of the Gas Industry. For the Gas Industry, gas is the main product; it is only at times of off-peak load that it would be possible to utilize some of the plant to provide gas for the production of a by-product such as liquid methane. There is also, of course, the question of repair and maintenance of plant during off-peak periods, which include the summer months. "Off-peak" does not necessarily imply idle plant which could or should be used for all and sundry purposes. The Paper suggests, however, that methane could be stored as a liquid and used to bring up the calorific value at times of peak load, to the extent of its use diminishing capital charged for plant otherwise necessitated by an uneven load. Liquid methane would have to compete for this purpose with imported oil, which the Authors of the Paper suggest it might be able to do if it could be produced at a low enough cost. Which proviso, of course, is not unimportant. There is the further possibility of sale of some liquid methane for motor transport purposes, there is the possible importance of extraction of ethylene, there is the additional purity of the gas that can be got by using the available cold, so that no definite conclusions as to the economics have yet been drawn.

At the start of the work on liquid methane, it was suggested that it might be possible to convert most of the coal to methane, by hydrogenation and catalysis, to liquefy it and to store it, thereby eliminating the impurities in gas and the necessity of large gasholders. It was pointed out that two underground tanks or chambers (25 ft. by 20 ft. by 10 ft.) would be more than the equivalent of a 10 million cu.ft. gasholder; the space occupied by the liquid is about 1/1000th that of the thermally equivalent volume of coal gas. It is all extremely interesting, but the

Authors themselves are at pains to point out that no doubt the suggestions were too radical and the cost would probably be far too high. Nevertheless the possibilities exist; and when it came to be known that in America natural gas was being stored on the large scale, the possibilities seemed worth while pursuing. It might, they suggest, be convenient to avoid uneconomic production of gas in small quantities at outlying gas-works if liquid methane could be delivered from large works in insulated tanks by road. The Authors' point is that though the cost of transport of oil for a given energy content by road is higher than the cost of transmission of gas on the large scale in pipes, it is cheaper to convey small quantities of liquid by road.

We set out here what the Authors consider are the possibilities relating to liquid methane and gas manufacture:- Storage of "calorific value" in a small space compared with gas storage, and the consequent general reduction in size of plant and idle capital; enrichment of gas by methane instead of by oil, which depends on the cost of oil for carburetting and future policy in regard to importation; assisting the control of the constitution of the gas; assisting the purification of gas, complete removal of sulphur, water, and carbon dioxide; benzole and ethylene extracted as by-products; helping the oxygen production for total gasification; substitution for small outlying gas-works; and finally as fuel for motor transport.

The "GAS JOURNAL" and "GAS SERVICE" will return to London on September 14, from and after which date the Address will once more be the familiar one of long association: No. 11, Bolt Court, Fleet Street, London, E.C. 4. Telephone: Central 2236.

Personal

Retirement of Mr. J. Wesley Whimster

Mr. J. WESLEY WHIMSTER is retiring at the end of the month from the post of Director, Engineer, and Manager of the Bath Gas Company after over 45 years' active service in the Gas Industry. He has been at Bath since 1914, having been appointed Engineer and Manager in November of that year in succession to Mr. C. Stafford Ellery, who retired after 35 years' service, while retaining his seat on the Board. Throughout his career he has upheld the traditions of a family of long association with the Industry, his father having been Manager of the Armagh Gas Company.

Educated at the Royal School, Armagh, Mr. Wesley Whimster in 1896 entered upon an engineering apprenticeship with Ashmore, Benson, Pease & Co., Ltd., going through the various workshops, drawing office, &c., and being employed on outside erecting work. In 1900 he became Assistant Engineer and Manager of the Redhill Gas Company under Mr. D. H. Helps, who subsequently went to Reading and whose own retirement was announced some months ago. Three years later Mr. Whimster became Assistant Engineer of the South Suburban Gas Company under Mr. S. Y. Shoubridge, and it was from the Sydenham works that he secured the Bath appointment.

After coping with the difficulties arising out of the first Great War he became President of the Southern Association of Gas Engineers and Managers in 1921, and in his Presidential Address he was able to report that the output of gas at Bath in 1920 had shown an increase of over 30% over 1913. Last April, when for the first time since the outbreak of the second Great War it was possible to publish statistics, he recorded that the 1944 output had shown an increase of more than 25% over 1939. In June of last year Mr. Whimster was one of 148 of the Company's personnel about a third of the total, who received awards for 25 years' service and upwards, the average length of service being 35 years.

Under his management the Bath Gas Company has always ranked high among the more enterprising undertakings, and manufacturing efficiency has kept pace with progressive development in distribution. The needs of the outlying districts have always received attention, and a notable extension was effected in 1939 when the Company acquired the undertaking of the Calne Corporation, linking up its mains and affording supplies to many of the districts *en route*. His devotion to his own undertaking has not prevented Mr. Whimster from taking active part in the national organizations of the Industry.

Mr. Whimster is to be succeeded as Engineer and General Manager at Bath by Mr. C. BATEMAN, General Manager of the York, Harrogate, and District Group of Gas Companies under the United Kingdom Gas Corporation. Before going to Harrogate in 1933, Mr. Bateman was Chief Assistant to Mr. Whimster at Bath, and thus returns to familiar ground after some years' experience of successful integration in the North.

* * *

Mr. ALEXANDER MCDONALD, B.Sc., A.R.T.C., A.R.I.C., who has been General Manager of the West Riding Group of Gas Companies since Jan. 1, 1944, took up his duties as General Manager of the York-Harrogate Group of Companies on Sept. 1. The Group comprises the York, Malton, Harrogate, Easingwold, Yeadon and Guiseley, and Otley Companies. Mr. McDonald, who is to retain his connexion with the West Riding Group as Director of the 15 Companies associated with this organization, is succeeded by Mr. H. B. TAYLOR, former Chief Engineer of the United Kingdom Gas Corporation, Ltd.

* * *

Mr. REYNOLDS-DAVIES, B.Sc., M.I.Chem.E., has been appointed to the position of Deputy Secretary of the Institute of Fuel, and will take up his duties in a few weeks' time. Mr. Reynolds-Davies received his technical education at University College, Cardiff, and the South Wales School of Mines. He has had a wide experience as a chemical engineer and fuel technologist for several years. His industrial experience was obtained first of all as chemist on the Coke Oven Plant of the Cambrian Combine, now merged with the Powell Duffryn Associated Collieries, Ltd., and he was later engaged as assistant with the late Dr. W. R. Ormandy. This work was followed by nine years as one of the Chemical Plant Managers with British Industrial Solvents, Ltd. For the past three years he has held the position of Manager of the Development Department of the Royal Ordnance Factory at Bridgend.

* * *

Mr. J. A. SPEERS, M.Sc., Chief Chemist and Technical Assistant to the Preston Gas Company, has been appointed Chief Chemist and Technical Assistant to the Middlesbrough Gas Department, in succession to Mr. W. CLARK, B.Sc., who is leaving to take up an appointment as Assistant Engineer and Manager to the Oriental Gas Company at Calcutta. Mr. Speers holds the Diploma of the Institution of Gas Engineers and is an Associate Member of the Institution of Mechanical Engineers. He was awarded the Silver Medal of the Society of British Gas Industries in 1936 for his Paper on "The Control of Oxide Purification Plant," and his thesis for the degree of Master of Science dealt with "Heat Transfer in a Continuous Vertical Retort Setting." He is President-Elect of the Manchester and District Junior Gas Association.

* * *

Mr. R. H. BUXTON, M.I.Mech.E., late Deputy Engineer and Assistant General Manager of the Wandsworth and District Gas Company, retired on June 30. His address is now "Herndon," 7, Kingsdown Road, Epsom. Phone: Epsom 9140.

* * *

Mr. A. F. DANN, Distribution and Sales Superintendent of the Skegness Gas Department, has been appointed Assistant Manager of the Maldon, Witham, Halstead, and Earls Colne undertakings of the British Gas Light Company. The vacancy at Skegness has been filled by the appointment, as Sales Superintendent, of Mr. B. VERRALL, of the Nottingham Gas Department.

* * *

The many friends and acquaintances of Mr. W. F. RODGER, Technical Representative of R. & J. Dempster, Ltd., will be glad to learn that he has now recovered from an operation which has been the cause of his absence for a considerable period. He hopes to resume his former activities in the near future.

* * *

Mr. R. M. H. BUNTING has been appointed Sales Representative of Cannon Iron Foundries, Ltd., for the south-west area of England. Before the war this area was covered by Mr. G. I. HOATSON, who will take over another area when he relinquishes his duties in the Navy.

Obituary

Mr. JOHN MARTYN COLLINS, a Director of the Stamford Gas Company, has died at the age of 73.

* * *

Mr. DAVID ROBERTSON, J.P., late Gas Engineer, Dunoon, died on Sept. 3. He was in his 88th year.

Letter to the Editor

DEAR SIR,—I had intended to give my views on atomic energy in relation to the prospects of the Gas Industry at the opening meeting of the Scottish Junior Gas Association (Eastern District) when I concluded my year of office as President, but as the subject has loomed into the limelight I will give them now in the form in which I had written them:

"Since our last meeting an event of historic significance has taken place—the emergence as a practical proposition of the use of atomic power. The question has been raised as to whether coal and everything built on coal, including the Gas Industry, are to survive. Among those qualified to know, two contrary opinions have been expressed, one that the industrial application of atomic energy will not be long in coming, and the other that the time is not yet. But there is one thing common to those two views, and that is that it will come. However that may be I cannot help thinking that the coal resources which are there are there to be used. I would recall also that at one time when railways first appeared people said that was the end of horses. As things worked out it was the beginning of horses. Far more horses were needed subsidiary to the railways than had ever been needed before.

"I would estimate the survival value of the Gas Industry not by the number of threats to its existence, but by the intellectual liveliness of its personnel. The meaning of this to you and to me, is 'Do not be ordinary or do what is ordinary—the liveliest thought and initiative are called for.' To produce this is what we can do. Following that, it is probable that the survival value of the Gas Industry is dependent on the use it makes of the talent it commands. Following this further, I deprecate the idea, all too tacitly accepted, that the researches to be carried out will be done in and by London. The founder of the Gas Industry—William Murdoch—was a Scotsman, and we Scotsmen are able to further our industry and should have the opportunity to do so—not elsewhere—but in our natural habitat, Scotland."

I would add further that the publication "Statements Relating to the Atomic Bomb" (H.M. Stationery Office, price 4d.) states that a major problem in the matter was the separation of the particular isotope 235 from the rest of the uranium by means of gaseous diffusion. I would recall that in my Presidential Address last October I said the separation of gases by thermal diffusion was a matter the Gas Industry ought to inform itself about, and on Jan. 13 this year Dr. K. E. Grew, of the Heriot-Watt College, gave us a lucid account of the process. I am yet hopeful that industrial research on the matter will provide the Gas Industry with a useful tool for more constructive purposes.

The most dangerous thing about atomic power from our point of view is that if the public gathers the impression that the Gas Industry is doomed, it will have an immediate bad effect on gas and gas appliance sales. The best corrective to this would be evidence that gas personnel were really alive.

15, *Warrender Park Terrace*, *Edinburgh*, 9.
Sept. 1, 1945.

Yours faithfully,
WILLIAM MASTERTON.

Diary

Sept. 13.—Association of Public Lighting Engineers: Conference in Glasgow.
Sept. 13.—National Federation of Gas Coke Associations: National Technical Committee, Gas Industry House, 2.30 p.m.
Sept. 13.—Solid Smokeless Fuels Federation: Technical Committee, Gas Industry House, 10.30 a.m.
Sept. 13.—Wales and Monmouthshire Association of Gas Engineers and Managers: General Meeting, Porthcawl, 10.45 a.m.
Sept. 14.—North of England Gas Managers' Association (Auxiliary Association): South Shields, 2.30 p.m.
Sept. 17.—London and Counties Coke Association: Finance Committee, 11 a.m.; Executive Committee, 11.30 a.m.; Central Committee, 1.30 p.m., Gas Industry House.
Oct. 10.—Southern Association of Gas Engineers and Managers: Annual General Meeting, Grosvenor House, Park Lane, London, W. 1, 2.45 p.m. Presidential Address by W. A. Howie. Luncheon at 1 p.m. General Committee, 11.30 a.m.
Oct. 17.—Eastern Counties Gas Engineers' and Managers' Association: Autumn Meeting, Grosvenor House, Park Lane, W. 1.
Oct. 17.—Institute of Fuel: Royal Geographical Society. Melchett Lecture by Professor C. H. Lander, C.B.E., 6 p.m.
Oct. 25.—Town and Country Planning Association: Lunch-time meeting, 28, King Street, Covent Garden, W.C. 2. Talk and discussion on "Town Planning and District Heating."
Nov. 27-28.—Institution of Gas Engineers: Autumn Research Meeting.
Dec. 6.—Town and Country Planning Association: Lunch-time meeting, 28, King Street, Covent Garden, W.C. 2. Talk and discussion on "Heating the Family Home."

Control of Benzole and Allied Products

In pursuance of Regulations 55 and 55AA of the Defence (General) Regulations, the Minister of Fuel and Power has made the Control of Benzole and Allied Products Order, 1945 (S.R. & O., 1945, No. 1064).

The Order, which came into force on Sept. 1, consolidates the provisions of the Control of Benzole and Coal Spirit Order, 1944, the Control of Benzole and Coal Spirit No. 2 Order, 1944, and the Control of Benzole and Coal Spirit Order, 1945, which Orders are revoked by the new Order. Instruments issued under the Control of Benzole and Coal Spirit Orders and in force on Sept. 1 still continue to have effect, but as if issued in pursuance of the corresponding provisions of the Control of Benzole and Allied Products Order.

The control of the disposal and acquisition of toluene previously controlled by an Order made by the Minister of Supply is brought within the scope of the Control of Benzole and Allied Products Order. The control of toluene formerly regulated by acquisition licences will now be controlled by disposal licences.

The Order has been published as S.R. & O. 1945, No. 1064, and the main alterations are set out in an Explanatory Note which has been printed with the Order. Copies may be purchased from any bookseller or direct from H.M. Stationery Office.

Screw Threads Conference

Sixteen Government officials and industrialists left London on Sept. 9 as a British delegation to the Conference on Unification of Engineering Standards which opens in Ottawa on Sept. 24. This is the third in the series of conferences between Britain, Canada, and the U.S.A. which have been held during the past two years under the auspices of the Combined Production and Resources Board.

During the fortnight the conference is scheduled to last there will be 15 sessions, and the subjects to be discussed will include truncated Whitworth threads, pipe threads, Acme threads, buttress threads, instrument threads, rolled sheet metal threads, solid round threads, high duty studs, unification of screw threads, outlet threads on gas cylinders, screw thread symbols, screwing tools, limits and fits, drawing practice, and metrology. During the conference it is intended that the delegates shall have facilities for seeing production shops and research laboratories in Canada and U.S.A.

Stockport's Wartime Activities

Members of the Stockport Town Council and a number of visitors made a tour of inspection of the Portwood works last week to see the developments which had taken place during the war years. The visit was also a preface to the opening of an exhibition of kitchen equipment at the St. Petersgate showrooms. At a luncheon which followed, Wing-Commander N. J. HULBERT, M.P., referred to the development of the Stockport gas undertaking during the 125 years of its history, and said that the present daily output of 10 million cu.ft. compared with 750,000 cu.ft. per day 75 years ago. Despite a 100% increase in the price of coal and a 40% increase in the cost of labour, the Department had only increased its basic price of gas by 10%.

Councillor S. HALL, Chairman of the Gas Committee, said a comprehensive extension of carbonizing and other plant which had been approved early in 1938 was put into operation in the first week of September, 1939, but the opening ceremony had to be cancelled owing to the war. The outstanding debt on the undertaking had been decreased by £35,000 since 1939 and now stood at £333,000, equivalent to £177 per million cu.ft. of gas sold.

Alderman J. T. LORD, former Chairman of the Gas Committee, revealed that the undertaking had played an important part in the development of Pluto, the under-ocean pipeline. Owing to a decrease in pressure a firm making certain parts of Pluto had almost to stop work when, after appealing to the Government, they were directed to seek Stockport's aid. Gas was supplied from Stockport and the job was finished.

Col. W. MONCRIEFF CARR, Managing Director of the United Kingdom Gas Corporation, responding to the toast of the visitors, said the Stockport undertaking was an example of sound development. There was a tendency throughout the country to-day to think that everything required replanning, but he did not think a better gas service could be provided from Westminster. It could be provided only by the development of existing undertakings and by co-ordination on the soundest lines. In the afternoon the Mayor, Councillor W. J. DAVIES, opened an exhibition of four kitchen units, manufactured by Littlewoods, Ltd., of Liverpool. The display included examples of modern kitchen gas appliances, a kitchen and bathroom unit, and a selection of kitchen accessories.

In Our Reference last week to the retirement of Mr. Ralph Halkett, the Sheffield and District Gas Company should have been described as the second largest gas *company* in Great Britain. Birmingham Gas Department is justly proud of being the second largest gas *undertaking*. Another obvious slip in the same paragraph was the reference to the growth of Sheffield's output to over 14,000,000 cu.ft annually; the figure should have been 14,000 million cu.ft.

Alderman A. R. Bretherick was wrongly referred to as Chairman of the Leeds Gas Committee in our report last week of the Leeds "Homes of To-morrow" exhibition. That office has in fact been held for some months by Councillor H. Sellers, O.B.E.

Woodall-Duckham War Service

When war started the Westminster headquarters of the Woodall-Duckham Company shut down at noon on Sept. 1, 1939, and temporary headquarters at Guildford started work on Sept. 4. Throughout the war there was practically no disturbance of office routine due to enemy action and no records were lost, and the Company carried out a large volume of essential work covering a wide range of plants.

A number of new installations of carbonizing plant have been built for the Gas Industry. Sixty-two continuous vertical retort installations on the Woodall-Duckham system were authorized during the period of the European war, with a total capacity of 3,715 tons of coal per day. The majority of the retorts incorporate the latest lambent-heated design. The largest new installation is that at Birmingham (Saltley) comprising sixty 103 in. retorts with a capacity of 658 tons per day. Other installations carbonizing more than 100 tons of coal per day include those at Torquay, Warrington, Liverpool, Bournemouth, Oldham, Glasgow, Dundee, Ipswich, Lincoln, and Paisley. A number of the new plants comprise extensions on small works ; of the 62 new plants, 19 are plants or extensions of not more than three retorts.

Three new installations of intermittent vertical chambers were authorized, with a total capacity of 457 tons per day. These comprise an installation now in operation at Aldershot, and an extension thereto now authorized, and an installation at Croydon—now in operation. Two new installations of static vertical retorts have also been proceeded with having a total capacity of 189 tons per day. One at Cambridge is now at work, the other at Southampton is now under construction. Each of these plants forms an extension of an existing static vertical retort plant.

The modernization and complete rebuilding of existing plants has been of considerable importance in maintaining gas output with the minimum expenditure of materials. Twenty-one installations of continuous vertical retorts with a total capacity of 3,257 tons of coal per day, have undergone or are at the moment undergoing complete reconstruction. A very large number of installations have been subject to partial repair or rebuilding along existing lines.

Since September, 1939, 12 orders have been received for new coke oven installations, with a total capacity of 5,760 tons of coal per day. Six of these plants are complete. Plants built for South African Iron and Steel Corporation, Pretoria; Wm. Baird & Sons; Nunnery Colliery Co.; Thorncliffe Coal Distillation, are at work, and plants built for Workington Iron and Steel Co.; British Benzole and Coal Distillation Ltd., are ready for work when required. New coke oven plants now under construction comprise installations of W-D Becker Ovens for Richard Thomas & Co., Ltd.; Barnsley District Coking Co., Ltd.; Consett Iron Co.; as well as installations of W-D Koppers Ovens for Rother Vale Collieries; the Gas Light and Coke Company; and N. H. & B. Collieries, Ltd. Two installations of Becker Ovens have been completely reconstructed during the war period at Nunnery and at Thorncliffe.

Taking the gas and coking industries together, the total carbonizing capacity of the new plants built or under construction since Sept. 3, 1939, including those completely reconstructed, amounts to over 5 million tons of coal per annum.

Apart from the construction of carbonizing plants the Woodall-Duckham organization has been used in connexion with a number of other war activities. They have built some of the largest continuous benzole plants in the country, amongst which may be mentioned the Barbet continuous distillation plants for Midland Tar Distillers, the Gas Light and Coke Company, and the South Metropolitan Gas Company. They have also built eight plants for the production of nitration toluole and four plants for the removal of CS_2 from benzole.

When the construction programme for plants for explosive production was at its peak, there was a need for an organization which could convert a set of blue prints into a working plant. The Woodall-Duckham Company offered to perform this function and undertook at short notice the purchase of the necessary equipment and the erection of plant covering a wide range of products at various of the Royal Ordnance Factories.

Among the plants built may be mentioned nitric acid plants, acid mixing plants, continuous nitro-glycerine plants and tetryl plants. One of the most interesting contracts was the design (in conjunction with the Ministry of Supply) and erection of one of the first plants for the filling of large bombs. When the explosives construction programme came to an end the constructional and drawing office staffs were re-absorbed into the Company's normal work. Apart from the constructional work mentioned, contact has been maintained by over 2,000 service visits to the various plants in this country for the purpose of discussing the problems of production and maintenance under the difficult conditions of the past six years.

The Gas Kitchen in Yorkshire

Under the auspices of the Yorkshire Section of the Gas Industry, with the co-operation of the Sheffield and District Gas Company, a Kitchen Planning Exhibition was opened at Jay's Furnishing Stores, Sheffield, on Sept. 5, and continues until Oct. 3. Cookery demonstrations and film displays are included in the programme.

A Press pre-view on Sept. 4 was attended by the Lord Mayor of Sheffield (Councillor G. E. Marlow), who declared the exhibition open. The Mayor of Rotherham (Councillor W. H. Lake) and the Mayor of Barnsley (Councillor J. Jepson), the Master Cutler (Mr. W. W. Wood), and members of Sheffield City Council and city officials were present.

Lieut.-Col. Sir Henry K. Stephenson, Chairman of the Sheffield and District Gas Company, presided, and was supported by members of the Board and Mr. Ralph Halkett, Director and General Manager.

Sir Henry Stephenson, commenting on the display as illustrating the great service which the Gas Industry could render in the kitchen, said unfortunately the present shortage of equipment owing to war conditions made it impracticable to furnish kitchens as fully as shown in the exhibition, but more would become available gradually; in the meantime the exhibition indicated what was to be expected, and suggested how house planning might be schemed with a view to taking full advantage of the many services of gas.

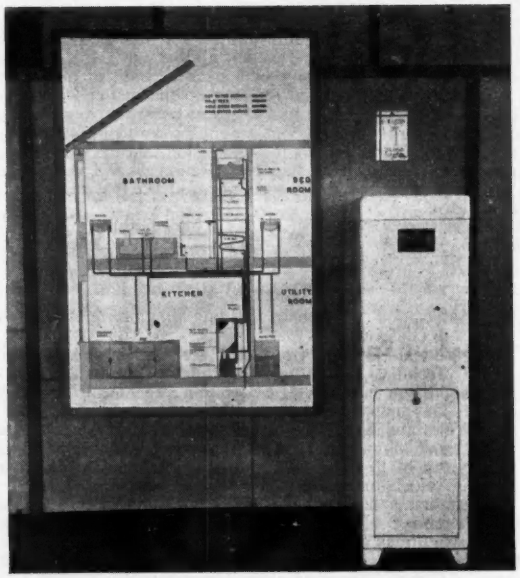
Sir Henry paid tribute to the efforts of Miss Jane Drew, F.R.I.B.A., who had designed much of the display, and to the work of Mr. Ralph Halkett, jun., the Sheffield Gas Company's Chief Engineer and Assistant General Manager, and Messrs. Hird and Wylie, of the Gas Company staff.

The Lord Mayor paid tribute to the Sheffield Gas Company for their services to Sheffield, and he mentioned especially their gallant maintenance of efficient service during the war.

The Master Cutler, proposing thanks to the Lord Mayor, said that if every kitchen in the country could have gas it would solve a good many problems.

Mr. Ralph Halkett, sen., seconding the thanks to the Lord Mayor, recalled how after the blitz the Company, foreseeing a prospective shortage of equipment for some time ahead, gave up its own showroom to a blitzed-out Sheffield stores firm. Mr. Halkett said he wished to pay tribute to Mr. W. H. Becket, of the British Gas Council, for the valued help he had given in arranging the exhibition.

The exhibition goes from Sheffield in October to Edinburgh—Sheffield being the centre for the North of England.



Organized by R.E.M.E. in the area of Yorktown, Camberley, and District Gas Company, an Exhibition at Arborfield was visited by a large number of vocational trainees of both sexes. A Potterton thermal storage set with coloured explanatory diagram attracted considerable interest as an example of what a properly designed modern hot-water installation should be.

In Addition to the abnormal requirements already placed by British-owned oil companies, Stewarts and Lloyds, Ltd., have been entrusted with the contract to supply the pipeline for the Iraq Petroleum Company, Ltd. The contract, totalling 120,000 tons of 16 in. diameter pipe, is the largest order for steel pipes ever placed in this country.

Edinburgh Street Lighting is not be to curtailed, although representations have been made that the lighting should be cut at midnight. The Lighting Department has indicated readiness to operate the cuts, but the Council viewpoint is that lighting has already been cut to the necessary point of economy. Only 25% of the gas lamps in the city are lit.

No. 3

Atomic Energy

[Specially Contributed]

This article concludes our series on the principles of the release of atomic energy and the possible bearing of future development on the Gas Industry. The first article was published in the "JOURNAL" of Aug. 29, and the second appeared in our issue last week.

Separation of Isotopes

It was shown earlier that the energy of disruption of one pound of U_{235} was about 3.6×10^{10} B.Th.U., which is equivalent to about 1,200 tons of coal. Although the weight ratio seems very large it should be remembered that whereas it is a comparatively easy matter to produce 1,200 tons of coal the production of even one pound of U_{235} may be very difficult. The U_{235} would probably not have to be completely separated from the commoner U_{238}, but even its concentration would require a good deal of effort. Only two satisfactory methods of isotope separation have been discovered up to the present. These are electrolysis and thermal diffusion.* The hydrogen isotope of mass 2, known as heavy hydrogen, is prepared by electrolysis of water. The chlorine isotopes of mass 35 and 37 have been separated by thermal diffusion. In this method the mixture of gases is passed up a tube which has a heated core and cooled walls, with the result that the lighter constituent appears at the top and the heavier one at the bottom. The method is applicable to some extent to liquids. Separation of the uranium isotopes would be difficult because the mass ratio is only 238 : 235, whereas with the hydrogens it is 2 : 1.

Control of Nuclear Fission

The possibility of controlling nuclear fission would appear to depend upon mixing some substance with the uranium which would absorb most of the neutrons that are liberated. It has been suggested by Adler and von Halben (*Nature*, 1939, **143**, 793) that cadmium would be suitable because its nucleus can capture neutrons without fission. Such a mixture would maintain itself at a high temperature without explosion.

Since the disruption of any heavy element into one of lower packing fraction will produce energy it is possible that heavy elements other than U_{235} could be used if suitable means of breaking down their nuclei could be found. There are already suggestions that another element has been used. The ideal raw material would, of course, be a common substance like mercury or lead.

Cost of Production

The only details of costs that have been given are that £500,000,000 has been spent on the production of the atomic bomb. The cost of production per pound of U_{235} is a secret and it can only be said that the production of one pound of U_{235} is not necessarily cheaper than the cost of the equivalent 1,200 tons of coal. Suppose, however, that the cost were considerably cheaper, what would the position be then?

Distribution of Energy from Nuclear Fission

It does not seem very probable that every householder will soon be provided with a pea of energy-emitting material to put in his cooker. It seems much more likely that the nuclear fission would be made to take place in a power station and the energy distributed by means of electricity. Whether it would be safe to build such a power station near a large centre of population is perhaps questionable. If the energy from nuclear fission were used to raise steam, and the electricity made in the present way, then only a maximum of 35% of the energy could be made use of. On the other hand it might be possible to produce electricity directly and so use the whole of the energy. At 100% efficiency 1 lb. of U_{235} is equivalent to about 10 million kw.h.

To put the effect of a cheap source of energy in perspective with the costs of distribution some figures from the annual reports of the Electricity Commissioners may be of interest. The cost of distribution of electrical power is high as regards both capital and annual costs. In 1938 the capital expenditure per kilowatt of generating power was as follows:

Generation . .	£19.2
Distribution . .	£49.1
Total . .	£68.3

Thus 72% of the capital expenditure, which amounted in all to £609,000,000, had been spent on distribution.

The average works costs of generation are given for 1933–34, when coal was at its cheapest in recent years, and for 1937–38, the last year for which figures are available.

Year.	Thous. mill. made.	Kw.h. sold.	Cost of coal and coke per ton.	Cost of fuel. d. per unit made.	Total cost of generation. d. per unit. Made.	Total cost of generation. d. per unit. Sold.	Total working Expenses. d. per unit sold.	Revenue. d. per unit sold.
1933-34	13.9	11.5	14/9	0.127	0.195	0.236	0.664	1.26
1937-38	23.0	19.2	18/6	0.137	0.182	0.216	0.614	1.047

For the same two years the total working expenses, excluding capital charges, expressed on a percentage basis were as follows:

	1933-34.	1937-38.
Generation: Fuel . .	23.2	26.7
Total works costs	35.65	35.5
Purchased	2.64	2.8
Cost of energy . . .	39.3	38.3
Distribution . . .	14.7	14.0
Management . . .	19.9	20.2
Local rates . . .	14.0	13.8
Other	13.1	13.7
	100.0	100.0

In 1938 the average fuel consumption was 1.42 lb./unit, but at the big power stations such as Battersea it was as low as 1.0 lb./unit. On the average the cost of coal and coke was about one quarter of the total working expenses.

In the limiting case in which the material for nuclear fission was produced very cheaply indeed it would seem that an analogy could be drawn with a country which has ample water supplies for power production, such as Norway. Some figures have been taken from the report of the World Power Conference of 1936. In 1935 about 14% of the water power from the waterfalls had been developed.

		Pop. mill.	Generator capacity. Kw. per head.	Sales of Electricity. Kw.h. per head. Domestic and Street lighting.	Total.
Norway	1934-35	2.87	0.520	570	2,620
Gt. Britain	1934-35	45.6	0.170	105	286
"	1937-38	46.0	0.193	167	419

The industrial load is high, but even in a country with such large water power resources there is difficulty in meeting peak loads. There is some sale of gas and coke for domestic purposes, but the annual gas production only amounts to about 2 therms per head compared with about 30 in Great Britain.

Although the costs of distribution of electricity are heavy, the production of power from a cheaper source of energy than coal would doubtless result in a big expansion of the electrical industry, but this would not necessarily be at the expense of the Gas Industry. It is clear that such changes as may take place can no longer be judged solely on economic grounds but that social and political considerations will become more and more important. By the time that atomic energy becomes available the whole of the fuel and power industries may be nationalized and it will then be for the Government to decide to what extent the country is still to depend on coal as a source of energy. The number of people willing to work in the mines may decline so much as to make the development of other sources of power essential, and indeed a lesser degree of dependence on coal would probably be welcomed by the public for its own sake. It must always be remembered, however, that coal is one of the chief sources of carbon for use in the chemical industry and that coke functions as a chemical as well as a source of heat, when used in a blast furnace. Those engaged in the coal carbonization industries may therefore increasingly come to regard themselves less as purveyors of fuel than as workers in a chemical industry. In this field petroleum is likely to be the chief competitor of coal. Thus synthetic rubber, toluene, &c. can be made from either. It would seem wise therefore for the Gas Industry, while still endeavouring to produce as efficient a fuel as possible, to pay increasing attention to the use of synthetic methods in the future.

* Since this article was written a pamphlet entitled "Statements Relating to the Atomic Bomb," published by H.M. Stationery Office, has appeared in which it is stated that thermal diffusion was the method used.

Has Research "Paid" in the Gas Industry ?*

By Dr. E. W. SMITH, C.B.E.

IT is a great compliment that an Englishman should be the first to be invited to deliver for a second time the William Young Memorial Lecture, and the present lecturer appreciates the fact accordingly. I readily acceded to the command of your President because I am one of the profoundest admirers of the life's work of William Young. Unfortunately for me I never met him. He died in 1907—the year before I first joined the ranks of the Gas Industry by becoming the Research Chemist to the Gas Heating Research Committee of The Institution of Gas Engineers at Leeds University.

William Young never had an orthodox scientific training, but no one had a greater natural instinct for the scientific method. His deductive powers and capacity for accurate observations were of a very high order, and his influence on the progress of the gas and shale oil industries cannot very well be exaggerated. It is not appropriate or timely that I should enlarge on the scope and results of his work in this address. That has been adequately done on a number of occasions, but never better than by Aldred Daniell in his "Appreciation" as an introduction to the first lecture. That "Appreciation," apart from the subject matter, was of a very high order, and I personally have received considerable inspiration and uplift on each of the many occasions on which I have read it through.

The work of William Young, however, did indicate to those of his day that if men of the right aptitudes could be encouraged to apply their knowledge, experience, and deductive powers to industrial processes, the harvests gathered would be rich ones, and if such men had their abilities reinforced by a thorough training in fundamentals, the results might conceivably be very much better. I think, however, he would have agreed that fundamentals alone are not enough, and the other qualities I have enumerated are even more essential. I expect to touch on this aspect of the question a little later in this Address.

It had been suggested I should give you my views on "Integration in the Gas Industry." I not only felt that my views are sufficiently well known, but I am nowadays so much out of touch with activities at headquarters that there was a danger that more harm than good would be achieved by exploring the pros and cons of integration or any other of the higher administrative policies of the Industry. It is fully realized by the rank and file that major changes in the administration of the Industry are overdue, and that a considerable amount of hard independent thinking is called for. Many reports from different sections of the Industry have appeared—mostly of an *ex parte* nature. Presumably it now remains for the Heyworth Committee to sort these out, eliminate the chaff from the wheat, and present a report of an independent nature which we hope will have as its objective the development of a wider use of gas, with a still better service, at a lower cost per therm generally.

I decided, however, after consultation with your officers, to try and answer the question appearing as the title of this Address rather more fully than was possible at the annual meeting of the Institution this year during the "questions" session. The question put before the meeting was rather more involved than mine, but I am sure I have got the questioner's intent correctly.

The William Young Memorial Lecture is so important and the subject of this Address is in my view of such paramount importance that I have taken the opportunity of discussing it with a number of my friends, among whom may be included W. T. K. Braunholtz, T. Vargas Eyre, A. T. Green, T. C. Finlayson, G. E. Foxwell, J. G. King, A. Parker, J. G. Pearce, and J. F. Ronca. It must not be assumed, however, that any one of them will necessarily agree with all that is contained in this Address. I do appreciate, however, the willing help and suggestions that have been given me.

No thinking or intelligent person—closely connected with the Industry—could give any but one reply to this question. Research does pay, has paid, and will pay. In fact without research developed to its fullest extent this country—which cannot adequately feed or even fuel itself under present conditions—will inevitably fall to a third rate power with a consequential reduction of the standard of living.

But does this apply to the Gas Industry? Of course it does. I believe, and I am sure most of you believe, that the Gas Industry is one of the essentials of modern civilization. In so far as it is progressive and makes the maximum use of its opportunities for development it will be adding that much as its contribution to the amenities, facilities, conveniences, and economics of our social system.

But while the supply of an adequate service of gas to the whole community for domestic, commercial and industrial uses is the primary objective, it is of equal importance that every detail and every branch of the business of gas production should be subject to the scrutiny of the scientific mind, whether such scrutiny be applied to coke, tar, benzole, sulphur, ammonia, gas-using equipment, or the development of new uses for materials available, so long as in the end such developments—to say the least—do not have the effect of increasing the cost of gas.

In an Industry whose members are by reason of legislative conditions non-competitive one with another, it is not always easy to show on an individual balance-sheet that research "pays," especially so in that the primary raw materials, coal and labour, apart from less important items, have over many decades shown a progressive increase in cost. Despite this a general review of aggregated figures is not unimpressive.

In 1920 the Industry, ignoring a negligible proportion of non-statutory undertakings, carbonized 17.566 million tons of coal, producing therefrom 214,703 million cu.ft. of gas—about 12,450 cu.ft. per ton—whereas in 1938 the Industry carbonized 18.469 million tons of coal to produce 276,484 million cu.ft. of gas—about 15,000 cu.ft. to the ton.

This increase of 20% was not secured by accident—or for that matter by reducing the coke yield—but by the efforts of engineers and chemists in the Industry, in contracting firms and elsewhere, to find new ways of improving plant, materials and methods—in other words by research, even though the word be spelled without a capital R. Silica refractories did not follow fireclay without effort and experiment, operation at higher temperatures could not be effected without risk of damaging plant on the old methods of estimating temperatures by eye; neither could the pyrometer makers have provided devices whereby even an unskilled man can read a temperature as easily as he tells the time by a clock, save for research—research in their own works and laboratories, and still more research by the Chateliers, the Callanders, the Siemens, the Fèrys and many others whose bread and butter did not come from the Gas Industry.

The savings effected by accurate temperature control may not show in a balance-sheet, but without the systematic search for information which has rendered such control possible either the improved results could not have been attained, or the present figures for repair and maintenance would be vastly increased. Again, tar—one of the Industry's "by-products"—was originally a curse to the Industry. No substantial uses were known. It was burned under retorts, attempts were made to carbonize it, it was buried in good land costing money. Accum—one of the pioneers in our Industry—operated a tar still as early as 1815, and in 1822 Longstaff and Dalston erected a plant in Manchester to produce light oils and naphtha for use as a solvent for rubber in the newly devised Macintosh cloth waterproofing process. Very little tar, however, was processed, though the amount increased somewhat in 1838 when the timber creosoting process was discovered and the advent of railways created a demand for creosoted sleepers. The total amount dealt with was still very small, and even in the middle of last century Dr. Ure urged gas undertakings to make better use of their tar than to use it raw as a fuel and allow the market price of such small quantities as could be sold to remain at about ½d. per gallon. Benzene had been discovered by Faraday in 1825, but it was not until 1845 that it was isolated from coal tar by Hoffmann. Then in 1847 Mansfield commenced the erection of a coal tar distillation plant for producing commercially pure benzole for restricted chemical uses and naphthas for use as burning oils and solvents. The real impetus to coal tar distillation came after 1856 when the first "aniline" colour was discovered, and in more recent times the gas-works by-product position has been improved by the recognition of the excellent anti-knock properties of benzole (as a motor spirit), and the demand created for naphthalene by the call from dye makers and plastics makers for phthalic anhydride. (It will not have been overlooked that even to-day large quantities of pitch and creosote are being used as fuel.) In short the conversion of an unmitigated nuisance into an invaluable commodity has turned wholly on various researches in widely diverse directions, which have resulted in the resolution of a highly complex noxious substance into its simpler and comparatively pure constituents, which are able to find a ready market in many different manufacturing fields where research had created openings for new raw materials.

By no means is the harvest always reaped by the sower, and least of all when the seed is represented by the labours of research workers. In the long run, however, these diverse labours advance progress in a kind of benignant circle—one man's restricted labours in his own interest opening up new fields to a neighbour, and all in unison tending to the advance of our civilization.

This process of mutual help is nullified to the extent to which the availability and digestion of all research results are neglected. The first duty of all research organizations is to study what has already been done by others, and to keep in the closest touch with other research organizations.

It will be appreciated that an advance in one direction may for a time involve an existing trade in difficulty. The development of the Haber ammonia process converted gas-works ammonia from an asset into a "purification cost." But mankind in general has benefited enormously by obtaining increased supplies of nitrogenous fertilizers at greatly reduced costs.

The immediate balance-sheet may, however, be a lying jade if used for purposes outside its essentials. Who, for instance, will doubt the benefits conferred by the comparatively recent researches leading up to the modern gas cooker and gas fire. Large savings in gas consump-

* **The William Young Memorial Lecture delivered before the North British Association of Gas Managers, Sept. 7.**

tion have been effected to the immediate benefit to the community, and even though momentarily the consequential reduced outputs may react adversely on the undertaker's balance-sheet, he benefits ultimately by retaining and even developing a load which he might otherwise have lost.

The Industry has used tar-separating devices of one kind or another almost since its inception. Tar-free gas reduces cost of purification and benzole extraction. The research development of electrostatic tar precipitators evolved from fundamentals that had been known for a century. In attempting to satisfy some of the electrical equipment requirements of the B.B.C. a contribution was made to a solution of some of the problems of tar precipitation.

We have on excellent authority been told that "if we seek we shall find." "Research" is an ugly hybrid which denotes much the same as that most proper word "seek," and though what we find may not be to our own immediate advantage, it may forthwith be precious to one or other of our many brothers—often in our own Industry. The world has now become very small.

No one can act without reaction on others—perchance many others. In the last decade, particularly, our eyes have been opened to the fact that our very existence may turn on our acting and thinking more truly as brothers. We should not, even though the balance-sheet reveal "truth" doubly distilled, look too casually at the figures and condemn them as unsatisfactory if they do not imply an immediate increase in our bank balances. The belief that research does not and has not paid is in effect a denial of what is possibly the most obvious of the three propositions enunciated in Luke xi, 9.

It will be noted that so far I have taken a very broad view of whether research "pays." I have underlined the universality of research endeavour. I shall now deal in more detail with the subject.

Technical industrial research in the Gas Industry can be divided into a number of quite distinct subdivisions—all of which are interdependent. There is the type of research called Fundamental—sometimes Academic—because it is usually carried out at the Universities. This is the most essential of all types of research because upon it depends the accuracy and validity of all other types of research. Instances of such research are:

(1) The determination of physical constants such as specific heats, conductivities, specific gravities, &c. &c.
(2) The determination of the constitution of organic compounds.
(3) The properties of metals and alloys.
(4) The study of chemical reactions between elements and compounds under varying conditions of temperature and pressure or in the presence of catalysts or impurities.

The effect of this type of research cannot very well be traced in balance-sheets.

Another type of research of great importance, but frequently overlooked—and still more frequently neglected—is that which depends on the collation of systematically obtained statistics concerning processes, and the behaviour of plants in which processes are carried out. The successful collection and utilization of such statistics depends solely on suitably trained staffs and the use of adequate laboratory facilities and instrumentation.

The gas technologist should, in his own way, be able to use his "stethoscope," his "blood pressure" tests, and his "meal" tests in his plants as readily as he would expect them to be applied to himself, but whereas he himself knows when he has his own symptoms of disorder and generally knows when all is going well, he needs regular systematic information concerning his process if he is to keep his fingers on the pulse to determine quality of production and thermal efficiency. With the exception of a few of the larger undertakings gas-works are not in a position to take advantage of this type of research to any great extent. Amalgamations and the development of the holding company make it more practicable.

The third type of industrial research is more orthodox. It is accepted as typical of what research should be. It is more obvious and has a direct bearing on results—commercial and technical. It can be illustrated by giving three different types which have engaged the Industry's attention over some years. These cover:

(1) Domestic heating, (2) gas lighting, and (3) heat transfer.

Domestic Heating.—Prior to 1908 the gas fire commonly in use consisted of a deep fire filled with clay and asbestos hollow balls. Just prior to that date some new designs were under development, and the Institution decided to finance research work on the subject to be carried out in the Fuel Department at Leeds. It was first necessary to devise means for determining quantitatively the various ways in which the heat evolved by the equipment under examination was being expended. Methods had to be worked out to determine the percentage of radiant heat, conducted heat, convected heat, and the heat passing up the chimney to waste (or as motive force for ventilation).

When this work was completed it was then possible by varying the controlling factors to vary the results.

A number of the gas fire makers gave assistance in this work by the loan of fires and moulds for making the newer types of radiants. Ultimately it was shown that the radiant efficiency of a gas fire depended on—

(1) The design of the radiants.
(2) The material of which the radiants were made.
(3) The correct aeration of the flames.
(4) The position of the radiant relative to the fire-brick back.
(5) The surface and composition of the fire-brick back.

The work proved sufficiently promising for the research chemist to give talks to the technical staffs of two of the leading firms, and on the completion of the work two of the Leeds research workers were appointed to two of the leading firms to take charge of their research work generally.

Gas Lighting.—The second piece of work was that carried out by Arthur Forshaw at Leeds on gas lighting. That was the beginning of the work on gas characteristics. He studied the effect of varying the composition of the gas on the luminosity of the mantle so far as it affected the shape of the flame—its aeration and its shape. He too obtained assistance from the burner makers. A little later the use of the inverted mantle became more general, and many of the factors influencing the conditions of the upright mantle luminosity were modified. Nevertheless the work was of great value to those who took up further studies of gas characteristics.

Heat Transfer.—For many years engineers, chemists, and physicists have been studying the underlying principles of heat transfer. To-day there is a team of workers at the Imperial College, led by Dr. C. H. Lander, who have developed this work in what might be termed a revolutionary way. During the coming session the Institute of Fuel is to have a contribution from this team of immediate interest fundamentally to the Gas Industry, and Dr. Lander in his Melchett Lecture in October will give an account of his team's work.

As a result of the fundamental research work that had been done on heat transmission prior to 1937, one of the leading contracting coke oven firms decided to carry out a full scale research on refractory regenerators as applied to coke ovens. It was desired that all the known factors affecting heat transfer should be assessed quantitatively and their relative importance determined. These included the bearing of radiation and conduction on raising gas and refractory temperatures, the effect of conductivity, heat capacity, weight, specific heat of the refractory materials among other things, and the influence of gas velocities, surfaces, and the like.

Such work requires expensive equipment and elaborate staffing, and extends over lengthy periods, night and day. We are looking forward to an *exposé* of this work at a session of the Institute of Fuel in the coming session. It will be appreciated that each of the above three types of industrial research is an instance of the way in which fundamental research has made it possible to carry out such work as applied to industrial problems.

There is no doubt that in each instance research has paid, and it has greatly benefited the economic status of the Gas Industry, directly or indirectly, but owing to the many varying factors that come into play it is not possible to indicate to what extent balance-sheets have been affected.

I have rather implied earlier in this Address that the Gas Industry stands in an exceptional position *vis-à-vis* other industries, in that it is made up of over one thousand separate entities, of which a very large proportion are so small that individually they are not robust enough financially to provide for modern technical control, and much less capable of individually carrying out expensive research. It must not be overlooked, however, that a small group of the larger undertakings is responsible for the production, distribution, and sale of over 75% of the total. A number of these larger undertakings as well as some of the contracting firms have, particularly during the last forty years, carried out a vast volume of elaborate research work which in the main has been made available to the financially weaker units. But the incentive is not quite the same as in normal competitive business. There is a distinct difference between a desire to maintain stability and the more forceful desire to increase profits. In effect local authority undertakings have to sell their gas at what it costs. (About 40% of gas sold is made by local authorities.) This state of things does not provide sufficient stimulus for research by such undertakings. It has to rely too much on a feeling of social responsibility.

The position is not much better among the company owned undertakings—but it is better. From a purely profit-making point of view the stimulus for expansion and improvement naturally comes from the makers of gas-making and gas-using equipment, and it can be said without any reservation that undertakings have given every encouragement to the appliance makers in testing and adopting new developments that have appeared as a result of their researches. In spite of the handicaps I have mentioned the use of gas for domestic and industrial purposes was never more popular than it is to-day. During the last forty years the use of gas by the community as a whole has more than doubled, and it must be remembered that at the beginning of the century it was already well established. This success is attributable to two main causes: (1) Town gas is established as a national utility, almost a necessity, and (2) the technicians in the Industry have had sufficient ability and enthusiasm to keep the gas service abreast of the times. But much more remains to be done. This has been realized for many years, otherwise the association of the Industry with Leeds University would never have come about. The Gas Industry were pioneers in this respect, and the results have been remarkable for the small amount of money that has been spent. It has undoubtedly paid.

The most important direction in which it can be said that the research work of the last forty years has been of use to the Industry has been the educational value of the reports on research work appearing in the Press, and fully discussed at meetings of the Institution, District Associations, and particularly the Junior Gas Associations. These reports have thrown new light on old problems, and given the gas engineer a much clearer understanding of the technical aspects of the work in which he is engaged.

The most outstanding advance, in my view, in carbonization practice during the last forty years has been the evolution of the continuous vertical retort. Harold Woodall and Arthur Duckham—then at Bournemouth—conceived the idea of applying the continuous principle to the treatment of coal in 1903. In 1907 the first commercial unit was in operation.

In the meantime Glover and West were following up the ideas of William Young and were developing the same principle. They used steam for cooling the coke, and very early realized that varying quantities of water gas could be made during the progress of carbonization.

Under the stimulus provided by the Great War the research work of the Institution of Gas Engineers in 1919 took a new and important turn. To understand the implications of this work it is worth while spending a few minutes in recalling the problems which called for solution at that time.

The old illuminating power standard had been shown to be inapplicable to most of the uses for which gas was required. The principle of charging for gas on a thermal basis had been accepted in official quarters. Increased prices for coal made it imperative that a greater proportion of the heat in the coal should appear as gas. Competition from electricity was increasingly severe, and a study of the efficiency of gas production and of utilization was indicated as a paramount necessity if the Gas Industry was to meet adequately the changing conditions.

During the war sufficient practical experience had been gained in steaming vertical retorts to indicate that greatly increased yields of gas could be obtained in this way. Some of the reported results were so high as to be almost incredible, and gave rise to much discussion on very little established fact. As a consequence, the Gas Investigation Committee inaugurated as part of its research programme a comprehensive investigation into the efficiencies of various methods of gas production. Its first work, carried out in 1919–20, consisted in a series of large scale tests of the efficiency of producing gas by steaming continuous verticals.

To-day we accept this method of gas manufacture as a matter of course, and it is well to pause to review the tests which were carried out at Uddingston on Glover-West retorts, which provided for the first time impartial and accurate data as to the results which could be obtained when steaming continuous verticals to produce various qualities of gas ranging from 544 to 410 B.Th.U. per cu.ft.

I am placing before you in the attached table some of the leading results of this series of tests. The coal used in each test was Lanarkshire Main and Ell coal containing about 10% moisture as charged. In considering the results one must remember that the retorts were of fireclay construction, and the carbonizing temperatures used were therefore moderate as compared with present practice. With our present knowledge it would be possible to repeat the series with greater refinement in the regulation of throughputs and outputs at the various calorific values. Nevertheless, the tests clearly showed for the first time that in steaming vertical retorts we had a method of gas production capable of increased yields per ton accompanied by increased thermal efficiencies and of great flexibility to meet varying conditions. The thermal output per retort increased with reduction in calorific value up to a point, after which it remained constant over a considerable range of calorific values. With regard to flexibility, I would call your attention to the variation possible in the ratio of the heat in the coke for sale to that in the gas. With no steaming there were 2.87 therms as coke for each therm as gas, while by increasing the steaming this figure dropped to 1.034 therms as coke for each therm of gas.

Test Number.	1.	2.	3.	4.	5.
Percentage steaming	*Nil*	13.3	22.1	32.7	44.8
Calorific value, B.Th.U./cu.ft. ...	544	482	447	436	410
Thermal yield per ton of coal as charged	50.96	61.05	68.04	77.67	80.33
Thermal yield, therms per retort per day	159.4	200.0	252.1	267.0	249.4
Fuel consumption B.Th.U. per therm in gas	0.599	0.491	0.464	0.426	0.443
Ratio $\frac{\text{Heat in coke for sale}}{\text{Heat in gas}}$ ...	2.87	2.03	1.62	1.26	1.034
Thermal efficiency of gas production	54.37	58.21	57.99	62.09	58.56
Tar yield gall./ton	13.2	16.4	16.8	20.4	21.2
Amm. sulphate yield lb./ton ...	32.7	33.1	34.6	38.0	39.4

It would take me too far to deal in any detail with the effect of steaming on the cost of gas manufacture. For this I would refer you to F. B. Richards's Paper on "Perspective in Carbonizing Costs."* I may, however, be allowed to quote his main conclusions relative to vertical retorts:

> "(1) The cheapest gas is made when retorts are worked at their maximum thermal output per retort per day.
>
> "(2) The leading influence on cost of manufacture is the price relationship between coal cost and returns for coke and tar.
>
> "(3) For a coal which is amenable to steaming there is little difference in the retort house cost of gas production over the range 500 B.Th.U. to 450 B.Th.U., but the lower the value of coke the more the attraction to make low calorific value gas. Against the retort house saving with low calorific value gas must be offset the increased works cost."

* F. B. Richards, "Perspective in Carbonizing Costs," "GAS JOURNAL," 31/10/34, 208, pp. 339–343.

The Institution's Uddingston tests, subsequently confirmed as they were by a similar series of tests on Yorkshire coal at the Fuel Research Station, gave a solid basis on which gas engineers together with retort construction companies have progressed. Can anyone doubt that the work has had a material influence on the prosperity of the Industry.

No discussion on this subject would be complete if reference were not made to the substantial contribution that has been made to the progress of the industry through the invaluable research work on refractory materials and cast iron.

It would not have been possible to have reaped the full benefits of the change over from the candle-power standards to that of the therm but for the improvements that have been made in the production and use of refractory materials that could meet the higher standards required by the new conditions.

So late as 1920 firebrick refractories were in almost universal use. The materials for the best coke ovens and intermittent verticals were often brought from Germany prior to that date. It was in 1920 that C. H. Middleton, of Consett, and the writer independently visited the United States to acquire the knowledge and experience of German practice that had been applied there. As a result of these visits the new technique of silica brick manufacture was applied at Meltham and Consett, and very soon it became the rule to build practically all carbonizing plants in silica materials. We would be the first to acknowledge that but for the continuous prosecution of research in many directions on this subject, carried out in the laboratories of a few of the larger undertakings and carbonizing contractors, most efficiently co-ordinated and amplified by Dr. Mellor and his team of workers, it would not have been possible for the state of the art of silica brick production to be where it is to-day.

The following extracts from the Transactions of the Institution of Gas Engineers are self-explanatory. They show that in spite of a big increase in temperatures the life of refractories in use has been doubled:

LIFE OF REFRACTORY MATERIAL.

Transactions of the Institution of Gas Engineers, 1910, p. 336.

Life of retorts without patching . .	Average	797 days.
with patching . . .	,,	1,257 ,,
Temperatures—Retorts	Average maximum	1,040°C.
,, ...	,, minimum	840°C.
Combustion chambers .	,, maximum	1,315°C.
,, ,, .	,, minimum	1,210°C.

The above refer mainly to horizontal retorts.

Transactions of the Institution of Gas Engineers, 1934–35, p. 396.

Life of Retorts:

Horizontals: Highest average .	About	2,500 days.
Lowest ,, . .	,,	1,000 ,,
General ,, . .	,,	1,700 ,,
Common experience .	Over	2,000 ,,
Several instances . .	,,	3,000 ,,

Combustion chamber temperature 1,250°C. to nearly 1,400°C.

Verticals: Vary from 1,000 to over 3,000 days.
In general five to six years before extensive rebuilding is necessary.

Note.—The above summarizes replies to questionnaires circulated in 1910 and 1934.

There is no research work being carried out to-day that is of greater service than that of the British Refractories Research Association on behalf of the Institution of Gas Engineers. A. T. Green, the Director, has given a summary of the work done by his organization since 1910. I have included it here as this major contribution is apt to be overlooked. The B.R.R.A. is an excellent example of the value of independent research organizations covering the problems of a number of industries of similar nature very much to their mutual benefit.

(1) At the outset there was an obvious need to secure the dependability of the refractory materials used in gas works which led to the framing of standard specifications (1910–1918).

(2) Work under (1) disclosed the absence of suitable tests of certain properties or the need for the standardization of other tests. Hence the early work on the refractoriness-under-load tests which was started about 1914 and has continued almost without interruption until the present time. The after-contraction test was examined about 1922 and is now being studied further. The measurement of crushing strength was considered in 1919, and a corrosion test was advanced about the same time.

(3) A phase in the investigation introduced somewhat later was the study of properties of refractory materials not merely from the aspect of testing and specifications (although the importance of this was not overlooked), but of better understanding the materials of construction. The bearing of this on improved design is obvious. Examples of such investigations are:

(*a*) The work on thermal conductivity.
(*b*) The effects of oxidizing and reducing atmospheres on refractory materials.
(*c*) The work on permeability to gases.
(*d*) The disintegrating effects of carbon monoxide and hydrocarbons on firebricks.
(*e*) The action of alkali vapours on refractories.
(*f*) Studies on slagging.

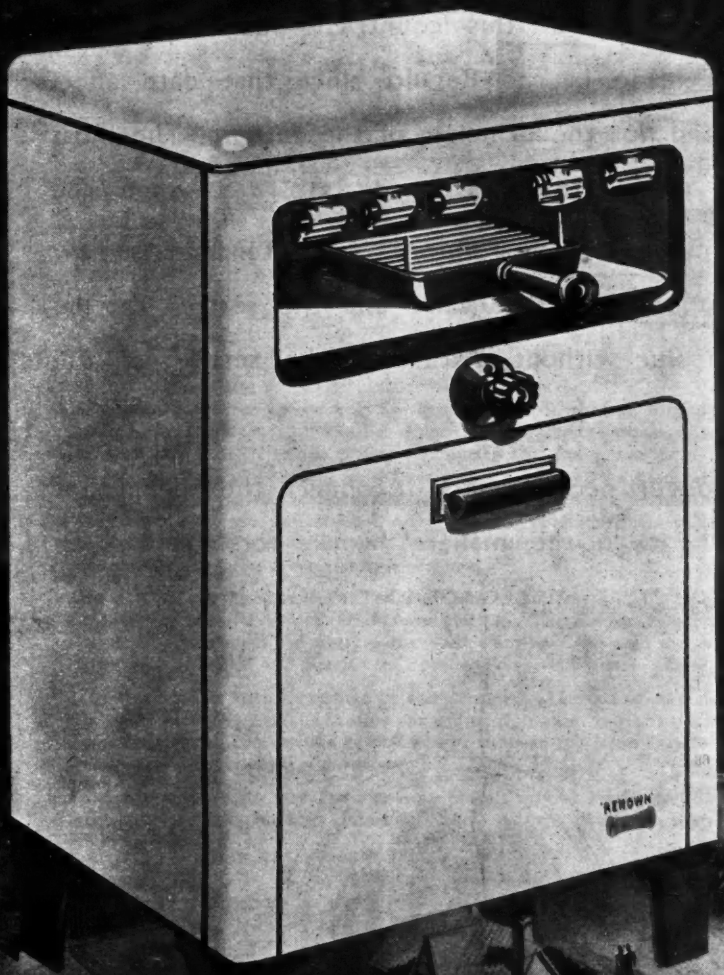
(4) Investigations designed to improve manufacturing technique were introduced fairly early in the research programme. Examples of this kind are:

(*a*) The purification of clay (1924).
(*b*) Experiments on the repeated firing of silica bricks (1924, 1931).

The RENOWN

A PRODUCT OF Parkinson

PIONEERS OF 'CLEAN LINE' COOKERS



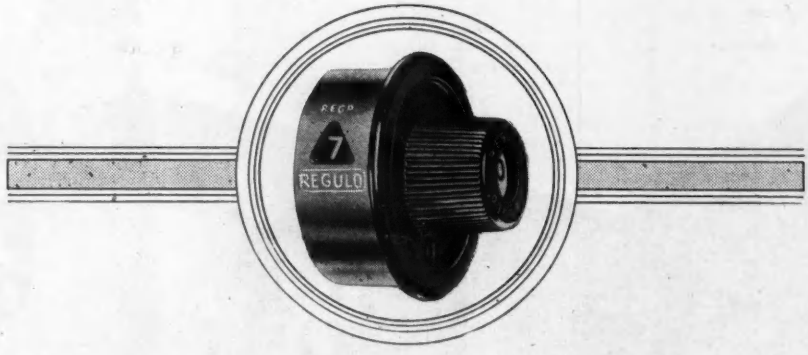
The "Renown" is an outstanding example of design and development and a notable contribution to the part the Gas Industry plays in the well-being of the Nation

THE PARKINSON STOVE COMPANY LTD STECHFORD BIRMINGHAM 9

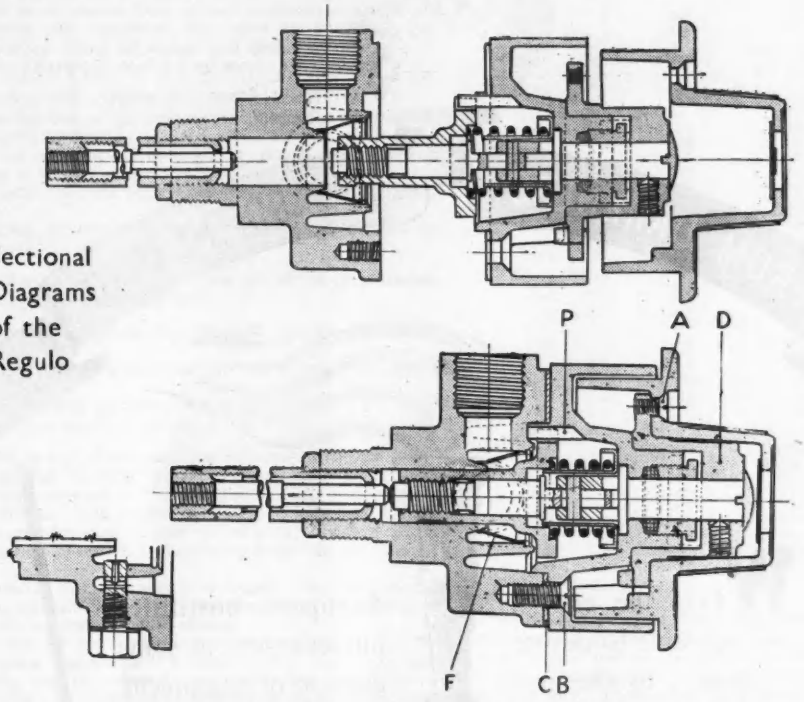
THE REGULO.... CLEANABLE IN SITU

The Regulo, an instrument of precision, was first supplied with the New World Cooker in 1923, thus introducing automatic cooking in this country. Such changes as have been made in the Regulo since that date affect the form and not the principle of the design. The most important modification was made in 1938 when the cleanable model was introduced. Maintenance is now very simple, as both the valve and the seating can be cleaned *in situ* without disturbing the setting of the instrument.

It is no longer necessary to disconnect the thermostat and return it to the makers' works for cleaning—an advantage of great importance to the Gas Industry.



Sectional Diagrams of the Regulo



The head is secured to the body by three screws (B), through flanged joints made gastight with a gasket (C). The dial spider (D), to which the dial itself is screwed, is permanently secured to the dial spindle during the setting operation. The valve is guided by a peg (P) attached to the removable portion of the head, while the valve spindle and dial spindle are joined by a permanent slotted link movement. Since the dial, when once set, cannot move more than one revolution because of a stop, the relative position of spindle and valve, upon which depends the setting, are invariable so long as the dial spider is secured to the spindle.

To obtain access to the valve and its seating for cleaning, remove the three screws (A), take off the dial, and remove the three screws (B). The body and visor portions will readily separate under the pressure of the valve spring. Although the valve can slide along its guide (P), it still cannot turn more than one revolution.

The valve and its seating may then be easily cleaned. The opportunity should also be taken of removing carefully the fine gauze filter (F) (which protects the valve seating), and cleaning it, and also the by-pass screw, although the latter may be removed for cleaning independently if required.

Re-assembly is equally easy, and the whole process may be readily and quickly carried out by the maintenance fitter on the spot, with no danger of affecting the setting of the instrument.

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WITH the end of European hostilities, we are able to devote our energies, in some measure, to the production of equipment for Public Lighting. It may still be some time before we are able to deliver from stock, but our clients may rest assured that our best efforts will be devoted to the execution of the many orders on hand as well as to any future requirements. We thank our clients for their patience during the past war years as well as for the understanding they have shown when the pressing needs of the Services rendered the production of lighting equipment out of the question. Early receipt of your enquiries will be greatly appreciated.

SUGG
WESTMINSTER

WILLIAM SUGG & CO. LTD., CHAPTER STREET, WESTMINSTER, S.W.1. *Vic 3211*

(*c*) Experimental firing of a Scottish fireclay (1928).
(*d*) Effect of firing temperature and grog content on properties of firebrick (1928).
(*e*) The behaviour of silica and sillimanite bricks on being pressed (1934–1942).

(5) The study of the behaviour of refractories in service in the Gas Industry has been prosecuted as opportunity offered from an early date. The lessons to be drawn from correct diagnosis of causes of failure, both normal and abnormal, may have an immediate (as distinct from a gradual) effect on design and choice of materials of retort construction. Examples of this kind are:

(*a*) Experiences with refractories in vertical retorts (1925).
(*b*) An investigation of the premature failure of a combustion chamber material (1926).
(*c*) Behaviour of refractory materials in vertical retorts (1931).
(*d*) Flaking of vertical retorts (1929, 1930, 1934).
(*e*) Examination of silica brickwork showing evidence of alkali action (1939).
(*f*) Report on behaviour of vertical retort used for making activated coke by the alkali process.

(6) The development of specialized types of refractory materials has not been overlooked. Examples are:

(*a*) Experiments on frothed clays (to yield insulating material) (1930).
(*b*) Refractory insulating materials of specialized kinds (1935–present time).
(*c*) Work on jointing cements (1921 onwards).
(*d*) Work on hot patching cements (1930–1934).

(7) Prior to 1939 nearly all the work on refractories for the Institution of Gas Engineers had been related to gas manufacture. Since 1939 the refractories required in the utilization of gas and of coke have received attention. The papers published include two dealing with temperature gradients and stresses in refractory fire backs, and many of those relating to refractory insulating materials (see Section (6)).

The several types of investigations have largely run concurrently, and the distinction is not clear-cut. Nevertheless, it is possible to point to noteworthy advances in each sphere.

In 1910 a technique of testing scarcely existed making all but the crudest specifications impossible. To-day certain tests are well established, quality can be assessed, and reasonable continuity of performance assured. In regard to (3), refractory materials are now applied with discrimination, the relative importance of the requisite properties being more fully appreciated. Manufacture (section (4)) has advanced notably; the technique of firing fireclay and silica products is now much better understood. Much still requires to be learnt about the mechanism of the deterioration of brickwork in retort working (section (5)), but during the last twenty years many important observations on flaking, alkali action, slag action and abrasion, &c., have been made. Bricks are chosen as far as possible to suit these carbonizing conditions. There have been many advances in the manufacture of refractory insulating materials (section (6)). The work of the B.R.R.A. for the Institution has contributed largely to this advance. Little other published work in this country on this subject has been noted. The use of dry materials as hot patching cements was studied in 1933. With reference to section (7), this work is perhaps too recent for the effects to be marked, but the possibilities of a gradated brick with a slag-resistant face and a porous backing have been demonstrated.

Another example of the usefulness of specialized outside research organizations to the Industry is to be found by a study of the work done for the Industry by the British Cast Iron Research Association. It is well known that the cost of maintenance and repairs and even the initial cost of construction have been materially reduced as a direct result of the research work carried out by this Association. J. G. Pearce, the Director, gave an account of this work to the Institution in 1938. It can be summarized as follows:

1. Research on the improvement of the mechanical properties of engineering cast irons and malleable cast irons, giving the user a greatly increased range of properties available through national specifications. These have been accompanied by improvements in production in the industry leading to greater soundness, dimensional accuracy and improved design, making possible reduced weights and section size in building and engineering uses.
2. The study of resistance to heat, corrosion and wear and the development of new cast irons such as Silal (silicon-iron alloy), Nicrosilal (nickel, chromium, silicon austenitic iron), and Cralfer (aluminium-chromium iron) for heat-resistance or combined heat- and corrosion-resistance.
3. Studies in vitreous enamelling giving better understanding of the effect of structure upon the vitreous enamelling process, improving appearance and reducing the cost of gas appliances,
4. Studies in the corrosion of cast iron leading to increased life and reliability of underground services.

It will be deduced from the table that although a few individuals and concerns were prosecuting a limited amount of industrial research

ALL UNDERTAKINGS.

	Number.	Gas made in mill. cu.ft.	Amount of money spent on research by I.G.E. and G.R.B. £
1905	1,615	173,577	55
1906	1,622	178,700	53
1907	—	181,392	400
1908	1,628	188,733	495
1909	1,626	193,826	430
1910	1,641	194,464	104
1911	1,628	199,083	206
1912	—	205,087	115
1913	1,620	210,499	380
1914	1,607	220,741	430
1915	1,601	229,195	344
1916	1,586	232,273	550
1917	1,578	232,474	1,139
1918	1,577	235,297	1,549
1919	1,577	249,536	3,943
1920	1,578	242,029	4,187
1921	1,559	260,764	4,913
1922	1,551	268,999	4,856
1923	1,542	265,097	5,355
1924	1,498	269,602	5,795
1925	1,487	281,874	6,451
1926	1,466	294,756	5,432
1927	1,450	304,965	5,960
1928	1,438	314,582	5,143
1929	1,415	318,509	6,360
1930	1,414	321,616	7,883
1931	1,396	329,722	7,840
1932	1,380	331,610	8,085
1933	1,349	329,619	7,942
1934	1,326	326,748	8,192
1935	—	—	9,759
1936	1,291	332,169	9,372
1937	1,266	342,228	9,836
1938	1,105	319,549	10,446
1939	1,086	319,062	10,943
1940	1,073	306,557	10,169
1941	1,059	329,476	9,644
1942	1,052	343,063	10,736
1943	1,049	348,104	18,421
1944	1,043	363,889	31,157

within the Industry forty years ago, there was practically no research being carried out by the Industry as a whole. The study of refractories—almost universally firebricks at that time—and an examination of gaseous heating seem to have been the first two subjects taken up in a serious way. From these figures it can be calculated that the expenditure of the Institution of Gas Engineers on research work in 1905 amounted to about 0.00002d. per therm of gas made.

In 1927 it amounted to about 0.0010d. per therm of gas made.
1943 " " 0.0025d. " "
1944 " " 0.0040d. " "

The highest figure is equivalent to about one-third of a penny per ton of coal carbonized.

We are asked—Has research paid the Gas Industry? On the money expended by the Institution on behalf of the Industry there seems very little to have to justify. The conservation of a therm per ton in gas manufacture is worth, say, threepence—ten times the expenditure on research—and many therms per ton have been conserved. An improvement in the thermal efficiency of gas manufacture of 1%, with coke at £2 a ton, is worth nearly fivepence, sixteen times the expenditure on research per ton, and the improvement in thermal efficiency has been at least 5% on coke consumption, making the comparison nearer 80 to 1. I think I have said enough to satisfy any sticky director of a gas company or member of a gas committee that research has paid—and does pay. The criticism that could with every justification be made of the Industry is that it has not taken research seriously enough.

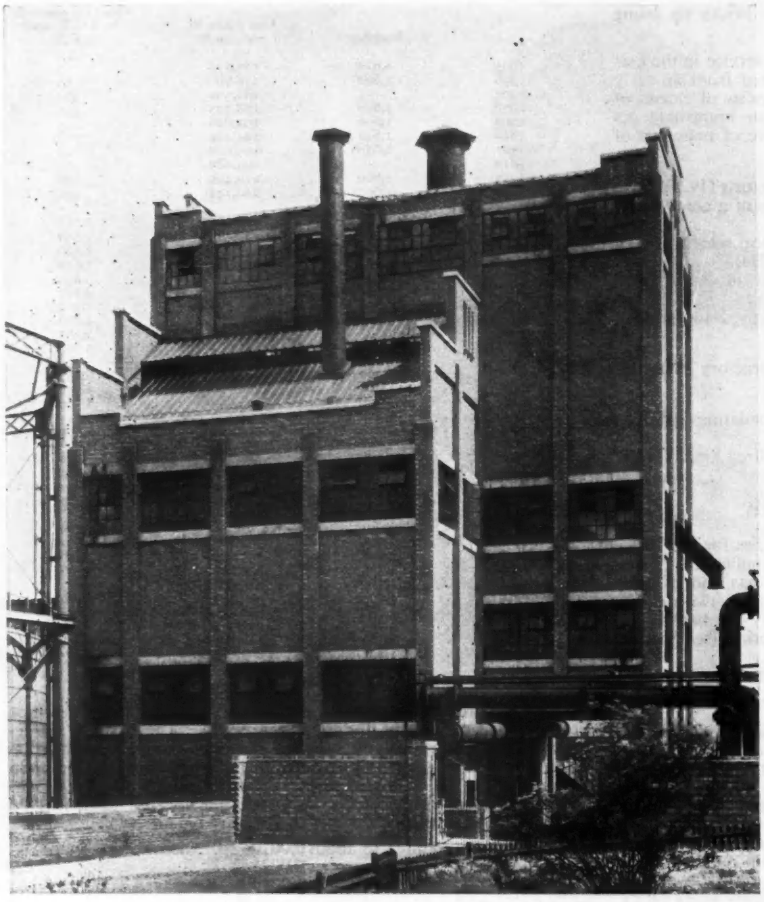
They are still only nibbling, and it takes a lot of nibbling to make an adequate meal. Such research is relatively a puny effort, but nevertheless of great value.

We need many teams of research workers, adequately paid with adequate facilities. There is no shortage of subjects or problems to tackle. As a beginning we should not think of an expenditure of less than one penny per ton of coal carbonized, which would amount to £100,000 per annum from undertakings alone, to which would be added a Government grant.

The Industry is entrusted by the community with the responsibility of supplying an even better gas service at the lowest possible cost. This can only be got by—

(1) Better administration.
(2) Improved technical personnel through better opportunities for education and experience.
(3) The provision of the fullest justifiable organization for research.

I have only touched on the fringe of the subject of this Address. I have been flooded with suggestions as to what I should include. I am afraid I have had to discard, through shortage of time and space, the vast majority of them. I hope, however, that in the country of William Young the Address has been worthy of one who would, I have not the slightest doubt, have been one of my most enthusiastic supporters had he been present to-day.



GLOVER-WEST

Vertical Retorts

at

HIGH WYCOMBE

ARCHITECTURAL FEATURES

From the layman's point of view, perhaps the most interesting feature is the attempt to produce in an essentially industrial building a pleasing architectural appearance. The steel frame-work of the building has been encased in brickwork, and the coal-receiving annexe and coke hoppers are built as integral features of the main building. A liberal use has been made of steel-framed windows for producing maximum natural lighting and ventilation. Parapets with "Snowcrete" coping form a pleasing finish to the skyline. Rain-water pipes are not visible, being taken down internally. The full effect of the building when viewed from Desborough Road is masked to some extent by the abutment of the old horizontal retort house, but when this is dismantled and the new retort house extended it will appear as an independent and symmetrically designed structure.

WEST'S

GAS IMPROVEMENT CO., LTD.

Miles Platting, MANCHESTER 10

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Infra-Red versus Convection Heating*

By CHARLES C. EELES

(*Concluded from p. 341*).

Rapid Heating Aim

Assuming the best paint formula and optimum baking temperature have been attained, the one remaining means of shortening the cycle is heating the work more rapidly. Where work can be so uniformly disposed to infra-red sources that equal intensity is received by all surfaces at close range without "shadow effect," then satisfactory results may be obtained through this method of heating. Such instances are extremely rare, however, and usually limited to such objects as flat sheets, tubes which may be rolled under the infra-red sources, and small pieces which are completely and uniformly enveloped in infra-red energy while passing through a tunnel type unit. In those instances where the above conditions can be met and where finishes are such that they cannot be harmed by high radiant intensities, this form of heating will give satisfactory results provided enough circulation is added to insure uniformity, prevent local over-heating, ventilate thinner vapours, and deliver sufficient oxygen to those finishes requiring it in their cure. Such ovens, utilizing either gas or electric heat, will unquestionably find acceptance where their design allows the concentration of greater heat intensities on work surfaces than obtainable from wall radiation plus convection transfer in modern convection ovens. This, however, will be difficult to accomplish on most products.

Most future installations will be called upon to handle not only a single job, but to cure perfectly a wide variety of finishes on a multitude of different parts having various colours, sizes, shapes and thicknesses of section. Oven builders, even those who include infra-red equipment among their products, feel that the convection oven is best adapted to most, if not all, industrial finish curing problems. The ability of this type to produce optimum uniformity is generally conceded. It has greater flexibility, and can be economically equipped with full and fool-proof safeguard control. It is a simple matter to provide the 150 cfm. per gallon of thinner per hour ventilation from continuous ovens and 350 cfm. per gallon of thinner per charge from batch ovens required to safely exhaust combustible vapours. Adequate fresh filtered air can be introduced at the time and place best suited to cure oxidizing finishes.

Certain of the earlier convection ovens, however, compared unfavourably on a speed basis with infra-red units when the latter were adapted to special purpose work. The erroneous belief has thus spread that convection ovens are necessarily much slower than infra-red units. This has been definitely proved untrue. In extensive tests conducted by the Committee on Industrial Gas Research of the American Gas Association, cures were effected in much shorter times with convection than with infra-red on pieces and finishes well adapted to radiant heating.

Past convection oven design has held delivery air to only slightly above the desired curing temperature and circulation used has been moderate. By heating the inlet air several hundred degrees above the curing temperature and at the same time employing increased volumes of circulation, those finishes which will withstand thermal shock can be processed with speeds equal to and in many instances far better than those obtainable in infra-red ovens. At the same time that uniformity, only attainable with convection heating, may be retained. Such a high temperature head takes advantage of both greater convection heat deliveries and the tremendous increase in wall radiation.

Continuous high-head convection ovens will use control of inlet air temperature and volume plus a timer on the conveyor to regulate the process. A great variety of products can be properly cured at highest allowable rates in the same oven merely by resetting the air delivery temperature and adjusting the conveyor speed as pieces are changed. Or, by adjusting the entering air temperature and conveyor speed to those required by the most sluggish part, such ovens may be used as general purpose units to handle various sizes, shapes, sections, and finishes.

High-head convection heating will likewise be applied to batch ovens with a programme controller acting on the temperature of either the oven or the inlet air. The high thermal head will be maintained until the work approaches proper curing temperature and then cut back sharply by the controller to prevent overshooting. Curing will then be completed at the proper temperature. Optimum curing speeds can thus be obtained in well designed batch ovens.

Other interesting possibilities in faster cures are under investigation. One is the development of finishes which can be subjected to a high temperature for a very short time, thereby acquiring a "heat set" of sufficient hardness to allow further processing of the part while the cure (either oxidation or polymerization) is completed over the next 24 or 48 hours at room temperature. Final assembly and testing may thus be taking place during completion of this delayed cure. High-head convection heating is ideally suited for this process.

A second development concerns the theory that improved and faster curing may be accomplished if the work pieces pass through a pre-heating oven and come to the spray booth at curing temperature. Spraying of these hot pieces followed by a short curing period in an oven just beyond the spray booth may result in an overall improvement in finishing results. Here again convection heating is well suited.

Convection Ovens Adaptable

A poll of the oven industry indicates that full convection ovens are best adapted to all-round work, and that if properly designed, curing speeds can result which are equal to or better than those obtainable by any other method. Nevertheless, some special purpose installations will utilize infra-red sources. These include processes where circulating atmosphere would damage the product by distorting, compressing, or otherwise disturbing the material being heated. Infra-red is likewise extremely effective for heating materials that can be penetrated by radiation, but which by nature are insulators and hence resist heating by conduction inward from the surface. It is well suited to portable units for intermittent use on relatively flat surfaces where close control of temperature is not too essential. Hard rubber, some glasses, and many synthetic resins are transparent to infra-red, and its use for heating them is, therefore impractical. White finishes are difficult to process perfectly in infra-red equipment.

The enormous possibilities of properly designed convection ovens have not, to date, been used to full advantage in industry. Their close temperature control is essential to uniform colour and colour matching. If often enables manufacturers to convert low-priced paints into finishes as durable as the more expensive grades. When desirable, heating speeds and curing times can be obtained which are equal to or better than any competitive method. In most circumstances the maximum production per cubic foot of oven volume is reached with convection equipment.

In addition to the new types of convection ovens discussed here, designers will in the future incorporate many refinements already worked out, but not so far generally applied. By bringing the make-up air in over the exit parts they will be cooled and the air economically preheated. This preheated air can then be used as part of that delivered from the heaters to the principal baking zone. The required volume of exhaust air will move out of the baking zone, passing over the incoming work to preheat it and flush out the thinner vapours. Such a zone system provides maximum thermal efficiency. High volume air curtains will be used at the ends of continuous ovens with an improvement both in temperature and atmosphere conditions for workmen in the surrounding areas. Improved panel construction with optimum insulation thickness and the least possible through-metal will minimize thermal losses. Above all, gas will be the preferred fuel.

Conclusion

The attempt here has been to review a bit of the theory and practice of industrial finish curing; and to stress the fact that future convection oven design will be able to attain equal or greater speeds than infra-red curing without its handicaps.

* From a Paper to the American Gas Association.

A General Meeting of the Wales and Monmouthshire Association of Gas Engineers and Managers will be held at the Grand Pavilion, Esplanade, Porthcawl, on Sept. 13, at 10.45 a.m. Mr. W. T. Kenshole, President, will introduce his successor, Mr. O. P. Cronshaw, and Major E. Ivor David, Regional Gas Officer, will present a Paper on "South Wales Gas Coals." There will be a luncheon at the Casino Ballroom and the "Upjohn" Golf Cup will be played for in the afternoon on the links of the Royal Porthcawl Golf Club.

An Exhibition which is creating a great deal of local interest has been staged at the showrooms of the Rugeley Gas Company. It consists of two model rooms, a utility room, and a kitchen, set out with all the most modern gas appliances. The utility room contains a Radiation coke stove for winter use, with a circulator for the summer, a washing machine, a sink (with taps underneath for filling buckets) and a drying cupboard. In the kitchen can be seen a latest type gas cooker, refrigerator, and Ascot water heater. The exhibition has attracted several hundreds of visitors. A competition, with a £2 prize, is being offered for the best constructive criticism of the layout.

A Final Dividend of 2½% making 5% for the year ended June 30, was declared at the annual meeting of the Northampton Gaslight Company on Aug. 9. Gas sales during the year showed an increase of 365,034 therms, equal to 5.5% over the previous year. Substantial increases have been recorded during the war, in all amounting to 1,435,752 therms, or 26% of the Company's pre-war sales. Notwithstanding difficulties in regard to coal and labour shortages the supply of gas was successfully maintained throughout the period. The balance carried to net revenue account was £24,655, against £42,885 for the previous year.

GAS PRODUCTS PRICES—STOCKS AND SHARES

The London Market Sept. 10.

The prices of Coal Tar Products are unchanged.

There have been two developments of interest in connexion with Coal Tar Products, the first being the cancellation of Government contracts for Toluene, and the second the issue of the Control of Benzole and Allied Products Order, 1945 (S. R. & O. 1945, No. 1064), which came into force on Sept. 1 and brings all Coal Tar Spirits under one and the same Order.

As from March 5, by the Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), the maximum price of Pitch for briquetting has been increased to 60s. per ton f.o.r. supplying works, and the prices for Road Tar, as fixed by the Coal Tar Products Prices Order, 1943, S. R. & O. No. 1528, have been increased by one half-penny per gallon. There is also an increase of 5s. per ton in the price of standard Creosote/Pitch Mixture.

Coal Tar Products Prices (No. 2) Order, 1944 (S. R. & O., 1944, No. 1051), allows increases in the maximum prices for all forms of Naphthalene.

The Provinces Sept. 10.

The average prices of gas-works products during the week were : Pitch and Crude Tar,* Toluole, naked, North, 90's. 2s. 4d. to 2s. 6¾d., pure, 3s. 2¼d. Carbolic acid, 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943, Naphthalene controlled under S. R. & O. 1944, No. 1051, operative from Sept. 22, 1944.

Attention is called to Coal Tar Products Prices Order, 1945 (S. R. & O. 1945, No. 229), referred to on p. 305, "JOURNAL" of March 7.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Scotland Sept. 8.

Quietly steady conditions continue to prevail. Refined tar*: Yield to Distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5½d.; low gravity or virgin oil,† 7½d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

Markets were fairly firm at the opening last week, and each day the number of markings exceeded those of the previous week. There was no definite trend, however, and while some weakness developed among gilt-edged stocks, a number of home industrials improved, especially among iron, coal, steel, and motor shares.

There was also a little more business among gas stocks and shares, although prices with few exceptions remained unchanged. A feature was the further sharp increase in Montevideo stock, which closed 12½ points higher at 127.

The following were the only price movements last week:

PROVINCIAL EXCHANGES

Bristol 5 p.c. max.	117—119	—1
Derby Cons. (x.d.)	132—137	Aug. 7
Ditto 4 p.c. Deb.	98—103	+1
Newcastle Units	24/6—25/3	—/1½d.
Sheffield Cons. (x.d.)	148½—150½	Aug. 27

OFFICIAL LIST

Associated Gas & Water 4½ p.c. Red. Cum. Pref. (x.d.)	21/—22/-	Sept. 3
Ditto 4 p.c. Red. Cum. Pref. (x.d.)	20/—21/-	"
Ditto 4 p.c. Cum. Pref. (x.d.) ...	19/3—20/3	"
Cape Town 4½ p.c. Cum. Pref. ...	12/—14/-	—
Croydon 5 p.c. Deb.	123—128	—2
Montevideo Ord.	122—132	+12½
Severn Valley Gas Corporation, Ltd.	23/3—24/3	—/3d.

TRADE CARDS

Address your orders and enquiries for
HUMIDINE
The unique anti-corrosion paint for gasholder cuppings, etc.
To the sole manufacturers:
ASPINALLS (PAINTS) LIMITED
CARLETON — SKIPTON — YORKS

FULL particulars of these spaces can be obtained on application to the Publishers. They are designed principally for the use of the firms whose display advertisements cannot be included owing to paper rationing.

BRITISH FURNACES LTD.
Derby Road, Chesterfield. T/N Chesterfield 3166. T/A British Furnaces, Chesterfield. London Office: 3, Victoria Street, S.W. 1. T/N ABBey 1096. T/A Pyrowork, Sowest, London.
Furnaces for Carburizing, Reheating, Normalizing, Annealing and Hardening. Industrial Gas Burners, Industrial Heating.

LEONARD BOTT LIMITED
Holyhead Road, Wellington, Shropshire.
T/A Leonardbot, Wellington, Salop. T/N Wellington Salop 320.
GASHOLDERS INSPECTED
Repairs and New Work Supervised.

CLAYTON, SON & CO. LTD.
Moor End Works, Hunslet, Leeds. T/N Leeds 75226-9. T/A Gas Leeds. London Office: 2, Victoria Street, S.W. 1. T/N Abbey 1754 or Ashtead 502.
GASHOLDERS of all types; BOILERS, PIPES, TANKS, &c.

TOM CARRINGTON & CO. LTD.
Lyndon Toolworks, West Bromwich. T/N 0317 (2 lines).
"LYNDON" and "EGA-KUT"
SCREWING TOOLS;
TAPS; DIES; STOCKS AND DIES;
GROUND THREAD TAPS

MAIN
Gas Cookers, Fires, Radiators, etc.
Large-Scale Cooking Equipment
R. & A. MAIN, LTD.
LONDON AND FALKIRK

HILMOR LTD.
Tube Bending Machines (Hand and Power). Tube Bending Specialists.
65, Calshot Street, King's Cross, London, N. 1. 'Phone: Terminus 4714 (2 lines).
We can supply machines for bending Gas and Steam Piping from ¾ in. to 2 in. in the cold state.

C. & W. WALKER LTD.
Midland Ironworks, Donnington, Wellington, Shropshire. T/N Wellington-Shropshire 12.
Makers of Gas-Works Plant of all descriptions.

Arkon
INSTRUMENTS
Gas Flow Recorders and Indicators
Pressure and Vacuum Recorders and Indicators
Full Scale or Inclined Gauges
WALKER, CROSWELLER & CO. LTD.
CHELTENHAM, GLOS. Cheltenham 5172

PECKETT & SONS LTD.
Atlas Locomotive Works, St. George, Bristol 5. T/N Fishponds 53006. T/A Peckett, Bristol. London Representatives: Ferguson & Palmer, 9, Victoria Street, S.W. 1.
LOCOMOTIVE ENGINEERS.

GOODALL, CLAYTON CO. LTD.
LEEDS.
Conveyors, Elevators, Bunkers, Roofs, Hoists, &c., Coal & Coke Screening and Sizing Plants, Retort Settings, Producers, Furnaces, Repairs.

MAINLAYING

E. E. JEAVONS & CO., LTD.,
Gas Engineers and Mainlayers,
TIPTON, STAFFS.

PUBLICATIONS

GAS ACCOUNT CALCULATORS

SUPPLIED either by Price per Therm or Thousand, for any specified Calorific Value, in book form, office charts, or pocket charts for Meter Inspectors, printed in clear type. Write for particulars to F. H. WAKELIN, LTD., Calculator Specialists, 354, WHEELER STREET, BIRMINGHAM.

'Phone: Northern 0989. 'Grams: Reckoners, B'ham.

BROADBENT'S SLAG WOOL

THE WORLD'S FINEST

FIRE-PROOF NON-CONDUCTING material for

GAS PLANT

of every description

J. C. BROADBENT & Co., LTD.

SLAG WOOL WORKS, REDCAR, YORKS, T.N. Redcar 16
54/5, LONDON WALL, LONDON, E.C. 2, T.N. City 4618

REPAIR WORK

CLOCKWORK Controllers for Public Lighting Control and Time Switches, Clocks and all type of instruments and appliances operated by Clockwork Repaired, Overhauled and Guaranteed. Inquiries welcomed. J. W. & R. E. Hughes (Clockwork Engineers), 58, Victoria Street, London, S.W. 1. ('Phone Victoria 0134.)

BOOKS

ENGINDEX. New Directory, Bibliography and Information Service for Engineers. Fully Comprehensive, always Up-to-Date, and essentially personal. Send stamp for particulars. BCM/ENGINDEX, London, W.C. 1.

WANTED.—Vols. 1 and 2 of *The Science and Practice of Gas Supply*, by Arthur Coe. Offers to be sent to No. 9472, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4.

PLANT &c. FOR SALE & WANTED

'PHONE 98 STAINES.

FOR SALE.—Weir Feed Pump, 8½ in. by 6 in. by 13 in.; Spencer Hopwood Boiler, 10 ft. by 4 ft. 3 in., 90 lb.; Sectional Steel Tank, 16 ft. by 16 ft. by 4 ft.; Steel Tank, 26 ft. by 10 ft. by 8 ft.; Weir Service Pump, 7 in. by 7½ in. by 18 in.; 30 h.p. H.S. Enclosed Steam Engine; 10 h.p. Steam Turbine.
HARRY H. GARDAM & Co., LTD., STAINES.

WEIGHBRIDGE.—15 ton motor Weighbridge for sale, platform 18 ft. by 8 ft. with ticket printing steelyard. Offers to No. 9473, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4.

IMPORTANT Belgian Firm dealing in gas appa-ratus for domestic and industrial use, buying for own account, asks offer from British manufacturers.
Write to the Ets. Henri HORN, S.P.R.L., 144, Boulevard Brand Whitlock, Bruxelles-Belgique.

FOR SALE.—EXHAUSTER by George Waller, capacity 40,000 cu.ft. per hour, coupled to horizontal steam engine, complete with 10 in. disc valves. Apply No. 9471, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C. 4.

PLANT, &c. (*continued*)

URGENTLY required.—Gas-fired Multitubular BOILER. Evaporation 800/1,200 lb. per hour. Working pressure 100 lb. Good condition essential. No. 9460, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C.4.

COMPANY NOTICE

BRITISH GAS LIGHT COMPANY LIMITED

NOTICE is hereby given that the TRANSFER BOOKS of the Ordinary Stock of this Company WILL BE CLOSED from the 17th to the 29th September, both days inclusive.
By Order of the Court of Directors.
Chief Office:
No. 2, The Abbey Garden, Westminster, S.W. 1. A. J. MUMFORD, Secretary.
September 12, 1945.

EDUCATIONAL

LONDON COUNTY COUNCIL

WESTMINSTER TECHNICAL INSTITUTE

VINCENT SQUARE, S.W. 1.

Telephone VICtoria 4221.

Principal—J. N. LONG, D.Sc.(Eng.), London, M.I.Mech.E.

THIS Institute provides Elementary and Ad-vanced instruction in preparation for the examination of Gas, Civil and Structural Engineers and National Certificates.
There is also a wide range of courses and single subjects dealing with these branches of Engineering.
New Session commences September 24, 1945.
Prospectus on application to the Principal.

CONTRACTS OPEN

CITY OF LEEDS GAS DEPARTMENT

TENDERS are invited for the Supply, Delivery, and Erection of FOUR PURIFIERS at the Meadow Lane Works.
Specifications and drawings may be obtained from the undersigned.
Tenders, in plain sealed envelopes, endorsed "Purifiers," must be delivered to the Town Clerk, Committee Department, Room 57, Civic Hall, Leeds, 1, not later than 11 a.m. on October 9, 1945.
Gas Offices, Market Hall, Leeds, 1. C. S. SHAPLEY, M.I.Mech.E., M.Inst.Gas E., M.Inst.F., Engineer and General Manager.
September 1, 1945.

CITY OF RIPON

(GAS DEPARTMENT)

TENDERS are invited for the Supply, Delivery and Erection of a VERTICAL WATER TUBE CONDENSER.
Specification and further particulars may be obtained from F. G. Bowness, Gas Engineer, Gas-Works, Ripon.
Tenders in plain sealed envelopes, endorsed "Tender for Condenser," to be delivered to the undersigned not later than October 5, 1945. The Corporation do not bind themselves to accept the lowest or any Tender.
Town Hall, Ripon. K. D. HANNA, Town Clerk.
September 5, 1945.

APPOINTMENTS VACANT

None of the situations advertised in these columns relates to a man between the ages of 18 and 50 inclusive or a woman between the ages of 18 and 40 inclusive, unless he or she is excepted from the provisions of the Control of Engagement Order, 1945, or the vacancy is for employment excepted from the provisions of that Order.

APPLICANTS for the Post of PUBLIC LIGHTING SUPERINTENDENT to the Bombay Gas Company, Limited, are hereby THANKED, and informed that the APPOINTMENT HAS BEEN MADE.

THE Liverpool Gas Company invites applications for the Position of WORKS MANAGER of their Linacre Works. The Salary will be in accordance with qualifications, but will not be less than £750 per annum, inclusive of all bonuses. The successful applicant will be required to pass the usual pre-employment medical examination, and if not more than 45 years of age, will be admissible to the Officials' Superannuation Fund, in addition to the Co-Partnership Scheme. Applications should be made on the official application form, which may be obtained by writing to the General Manager, Radiant House, Bold Street, Liverpool, 1, and which should be returned to him not later than September 15, 1945.

APPLICATIONS are invited for the position of WORKING MANAGER of the Aspley Guise and Woburn Sands Gas Company, Ltd., at a salary of £300 per annum with free house and fuel provided. Applicants should have a thorough practical knowledge of small Works routine and management, with sound ability to control labour.
Applications, stating Age, Training and Experience, together with *copies* of three Testimonials, should be sent to General Manager, Bedford District Gas Company, Ford End Road, Bedford.

APPOINTMENTS VACANT (*ctd.*)

A PROGRESSIVE Seaside Gas Undertaking (50 millions) in Cornwall has vacancies for the following:
(*a*) FIRST-CLASS GASFITTER (District), 1s. 8¾d. per hour.
(*b*) MAINTENANCE FITTER, 1s. 8d. per hour.
(*c*) IMPROVER, 1s. 5¾d. per hour.
Applications, giving details of training and experience, should be addressed to No. 9470, "GAS JOURNAL," 11, Bolt Court, Fleet Street, E.C.4.

THE Hong Kong and China Gas Company, Limited, have a vacancy for a TECHNICAL ASSISTANT at Hong Kong.
Particulars of this appointment may be obtained on application to the Secretary, The Hong Kong and China Gas Co., Ltd., 148, Gresham House, Old Broad Street, London, E.C. 2.

THE ORIENTAL GAS CO., LTD.

APPOINTMENT OF DISTRIBUTION ENGINEER FOR CALCUTTA.

THE above Company invite applications for the Position of DISTRIBUTION ENGINEER, the duties comprising the supervision, under the District Manager, of the mains and services and the maintenance of adequate supplies.
Candidates should have theoretical and practical knowledge of these matters and preferably (although not essential) some experience in consumer contact and the supply of gas for commercial and industrial purposes.
Age preferably not more than 35; the successful candidate must undergo a medical examination to satisfy the Company that he is suitable for service in the tropics.
The first period of service will be for five years, four-and-a-half of which will be in Calcutta and the final six months on leave at full pay. Passages out and home paid. A Provident Fund is in operation involving instalments of 5% of the basic salary payable by the Company and the officer, with interest accrued.
The Salary offered is £900 per annum, plus cost of living bonus (£225 if married, or £180 if single), together with free gas and coal. It is anticipated that the Company will provide furnished quarters for which a charge of £60 per annum will be made. The officer will pay his own Income Tax, the present effective rate being 2s. 9d. in the £.
Applications should reach the undersigned not later than September 26, 1945.
The candidate should state his Age, Education, Technical Qualifications, Practical Experience, and give the names of two referees who will testify to his personal character and technical qualifications.
The Oriental Gas Co., Ltd.,
Broad Street House,
54, Old Broad Street,
London, E.C. 2.
A. W. HENTSCH, Secretary.

THE LIVERPOOL GAS COMPANY

INDUSTRIAL DEPARTMENT.

APPLICANTS are invited for the following posi-tions:
(*a*) TECHNICAL AND INDUSTRIAL ASSISTANT.
Applicants, who should be not more than 35, and of good address, should have had a sound technical training and experience, and be capable of working on own initiative on combustion calculations and problems concerning the use of gas in Industry and for Central Heating and Steam Raising, &c.
Applicants should be Corporate Members of the Institution of Gas Engineers or possess the Higher Grade (Supply) Certificate, and/or the Higher National or National Certificate in Mechanical Engineering or equivalent.
Capable draughtsmanship will be considered an advantage. Commencing Salary according to qualifications, but not less than £400 per annum, including cost of living bonus. The above position provides opportunity for experience in an Industrial Department with prospect of transfer to Technical status subject to satisfactory progress.
Successful applicants will be required to pass the usual pre-employment Medical Examination, and will be admissible to the Officials' Superannuation Fund. Applications should be made on the official form which may be obtained by writing to the Personnel Superintendent, Radiant House, Bold Street, Liverpool, 1, and should be returned to him not later than September 30.
(*b*) COMMERCIAL SALES ASSISTANTS (two vacancies).
Applicants, who should be not more than 35, and of good address, should have a sound knowledge of, and experience in the choice and layout of large scale gas cooking equipment, &c., for canteens, restaurants, cafes, &c.
Applicants should preferably possess the Higher Grade (Supply) Certificate of the Institution of Gas Engineers or equivalent or should be able to give satisfactory evidence of study for such qualification.
Capable draughtsmanship will be considered an advantage. Commencing Salary £350 per annum, inclusive of cost of living bonus. The above position provides opportunity for experience in an Industrial Department, with prospect of transfer to Technical status subject to satisfactory progress.
Successful applicants will be required to pass the usual pre-employment Medical Examination, and will be admissible to the Officials' Superannuation Fund. Applications should be made on the official form which may be obtained by writing to the Personnel Superintendent, Radiant House, Liverpool, 1, and should be returned to him not later than September 30.
Sept. 4, 1945.

(Classified Advertisements continued on p. 378)

APPOINTMENTS VACANT
(continued)

WEST'S Gas Improvement Company require the services of two or three JUNIOR TECHNICAL ASSISTANTS for their outside staff. Applicants should have had a sound education and training in gas and/or mechanical engineering. Experience in the erection and operation of gas-works carbonizing plant would be an advantage. Salary according to Age, Experience, and Professional Qualifications. Applications should be addressed to West's Gas Improvement Company, Ltd., Albion Ironworks, Manchester, 10.

APPOINTMENT OF SHIFT GENERAL FOREMAN

APPLICATIONS are invited for the Position of SHIFT GENERAL FOREMAN to work on rotating shifts including Sundays. Applicants should be Gas-Works trained and have had experience in the working of Gas Manufacture and Steam raising Plant. He must possess proved satisfactory ability to control labour and should not be more than 45 years of age. Present wage £7 14s. per week.

The appointment will be terminable by one month's notice on either side, and successful candidate will be required to pass a Medical Examination.

Applications, stating Age, Experience and present position, together with information as to the position in relation to the Essential Works Order, and enclosing *copies* of not more than three Testimonials, should be addressed to the undersigned, to be received not later than September 29, 1945.

Gas-Works, D. C. CROSS,
Lea Bridge Road, General Manager and Engineer.
Leyton, E. 10.

BURGH OF FALKIRK

APPLICATIONS are invited for the appointment of ASSISTANT GAS ENGINEER AND MANAGER. Applicants must hold the Higher Grade Certificate (Manufacture), and be an Associate Member of the Institution of Gas Engineers. He must have had practical experience in all branches of gas manufacture and distribution, and be capable of taking charge in absence of the Engineer and Manager.

The Salary will be at the rate of £350 per annum, rising by annual increments of £15 to £450 per annum, with war bonus in addition.

The appointment is subject to the Town Council's conditions of service and Superannuation Scheme, and the successful applicant will require to pass satisfactorily a medical examination.

Applications in writing, stating Age, Qualifications, Experience and present employment, should be lodged with the subscriber not later than September 24.

Municipal Chambers, ROBERT LYLE,
Falkirk. Town Clerk.
September 5, 1945.

COUNTY BOROUGH OF WIGAN

APPOINTMENT OF TECHNICAL ASSISTANT AND CHEMIST

APPLICATIONS are invited for the Position of TECHNICAL ASSISTANT AND CHEMIST at a salary of £320 per annum plus bonus, rising, subject to satisfactory service, by annual increments of £15 to a maximum of £350 per annum, plus bonus.

The appointment in the first place to be temporary, consideration to be given to the question of making the appointment permanent when officials of local authorities have been demobilized from the Forces.

Preference will be given to candidates possessing the Higher Grade Certificate in Gas Engineering (Manufacture).

The position is subject to the provisions of the Local Government Superannuation Act, 1937, and the successful candidate will be required to pass a medical examination.

Applications, endorsed "Techical Assistant and Chemist," stating Age, Qualifications, Chemical and Gas Engineering experience, present position and duties, accompanied by *copies* of not more than three recent Testimonials, to be delivered to me not later than Thursday, September 20, 1945.

Municipal Buildings, WILLIAM HENRY TYRER,
Library Street, Town Clerk.
Wigan.

WANTED.—Works Maintenance Mechanic with knowledge of steam and electrical plant. Wage 2s per hour for 47-hour week. Permanent position for suitable man.

Apply Engineer and Manager, Gas-Works, Chelmsford.

This advertisement is inserted by permission of the Ministry of Labour and National Service.

NEWTON CHAMBERS & CO., LTD., Thorncliffe, Sheffield, require the services of two SENIOR DRAUGHTSMEN experienced in the preparation of drawings for gas-works plant. Applications, which will be treated in the strictest confidence, stating Age, Experience, and Salary required, should be sent to the Personnel Officer.

DISTRIBUTION ASSISTANT

APPLICATIONS are invited for the Position of DISTRIBUTION ASSISTANT to the Mossley and Saddleworth Gas Company, Ltd. The salary offered is £350 per annum (inclusive of war bonus).

The successful candidate will be required to pass a medical examination andto reside within the area of supply. A Company house will be available at a moderate rental.

Applicants must have a thorough technical knowledge and sound practical experience of high and low pressure distribution systems. They must be capable of preparing estimates and supervisin gplumbers, gasfitters, mains and service layers, &c.

Applications, stating Age, Qualifications, Training, Experience and position in relation to National Service Acts and Essential Works Order, together with three recent Testimonials, endorsed "Mossley Distribution Assistant," to be received not later than October 8, 1945.

Ashton Gas Company, R. B. FOSTER,
Oldham Road, General Manager.
Ashton-under-Lyne.

BURGH OF PAISLEY

(GAS DEPARTMENT)

APPLICATIONS are invited for the Position of TECHNICAL (CHEMICAL) ASSISTANT. The salary grade prescribed for the post is £300, rising to £400 per annum, with placing according to qualifications and experience, plus the current war bonus of £60 per annum. The post is subject to the provisions of the Local Government Superannuation Acts, and the successful candidate will require to pass a medical examination.

Applicants should have experience in the control of vertical retorts and carburetted water gas plants, and in the recovery of benzole and the manufacture of concentrated crude ammonia; they must possess the higher grade certificate of the Institution of Gas Engineers in Gas Engineering (Manufacture), or equivalent qualification.

Applications, stating Age, Training, Experience and Qualifications, together with applicant's position in relation to the Essential Works Order and National Service Acts, and accompanied by *copies* of three recent Testimonials, should be addressed to the undersigned for receipt not later than Saturday, September 29, 1945.

The Gas-Works, SYDNEY SMITH,
Paisley, Renfrewshire. Engineer and Manager.

BURGH OF PAISLEY

(GAS DEPARTMENT)

APPLICATIONS are invited for the Position of DISTRICT INSPECTOR (District Foreman: Fittings). The salary scale prescribed for the post is £260 rising to £300 per annum by increments of £20 (subject to satisfactory service) plus current war bonus of £60.

The appointment is subject to the provisions of the Local Government Superannuation Acts, and the successful candidate will require to pass a medical examination.

Applicants must have sound training and practical experience in gas-fitting and workshop practice; in the issue of work and materials; control of men; inspection of work on the district; and in the estimating of material requirements; they must possess the Final Certificate of the City and Guilds in Gas-Fitting, or an equivalent qualification.

Applications, stating Age, Qualifications, Training, Experience, present occupation, and applicant's position in relation to the National Service Acts and Essential Works Order, and accompanied by *copies* of not more than two recent Testimonials, should be addressed to the undersigned for receipt not later than Saturday, September 29, 1945.

The Gas-Works, SYDNEY SMITH,
Paisley, Renfrewshire. Engineer and Manager.

PETERBOROUGH GAS COMPANY

APPLICATIONS are invited for the Position of SHOWROOM MANAGER to take charge of the Company's showroom, organization of Sales Staff, Advertizing and Publicity work.

Full particulars of Age, Education, Training in Salesmanship, previous Experience, and stating Salary expected, together with *copies* of two Testimonials, to be forwarded to the undersigned not later than September 29, endorsed "Showroom Manager."

Applications from suitable candidates now serving in H.M. Forces or in War-time appointments will be given consideration.

Gas Offices, R. PRINCE,
New Road, General Manager and Secretary.
Peterborough.
August 31, 1945.

PETERBOROUGH GAS COMPANY

APPLICATIONS are invited for the Position of LADY COOKERY DEMONSTRATOR and Home Service Adviser at a salary of £300 per annum inclusive of War Bonus.

Applicants must be keen, good organizers, and possess the necessary experience and qualifications for this appointment.

Applications, endorsed "Demonstrator," stating Age, Qualifications, particulars of Present and Former Appointments, and approximate date available, together with *copies* of two Testimonials, to be forwarded to the undersigned not later than September 29, 1945.

Applications from suitable candidates now serving in H.M. Forces or in War-time appointments will be given consideration.

Gas Offices, R. PRINCE,
New Road, General Manager and Secretary,
Peterborough.
August 31, 1945.

COUNTY BOROUGH OF BLACKBURN

(GAS DEPARTMENT)

APPOINTMENT OF MAINS AND SERVICE SUPERINTENDENT

APPLICATIONS are invited for the Position of MAINS AND SERVICE SUPERINTENDENT to the Gas Department.

Candidates must possess the Ordinary Grade Certificate of the Institution of Gas Engineers (Supply), and must be fully conversant with both high and low pressure systems.

The salary will be Grade P.T. & A. (B), £315 per annum, plus war bonus of £39 19s. per annum.

The appointment will be subject to the provisions of the Local Government Superannuation Act, 1937.

Applications endorsed "Mains Superintendent," stating Age, Training, Qualifications and position in relation to the National Service Act, accompanied by three recent Testimonials, should be delivered to the Engineer and Manager, Gas Department, Town Hall, Blackburn, not later than Friday, September 21, 1945.

CHAS. S. ROBINSON,
Town Clerk.

NEW MILLS URBAN DISTRICT COUNCIL

(GAS DEPARTMENT)

GAS-WORKS FOREMAN

APPLICATIONS are invited for the Position of GAS-WORKS FOREMAN.

Applicants must have practical experience in the operation of Horizontal Retorts Plant Maintenance (preferably mechanically trained) and in the control of men.

The post is designated under the Superannuation Scheme, and the successful applicant will be required to pass a Medical Examination.

Salary payable £6 10s. per week, which includes the rent of a modern house, which will be available for the successful applicant.

Applications, stating Age, Qualifications, Experience and position under the Essential Works Order, with *copies* of two recent Testimonials, should be endorsed "Works Foreman," and forwarded to the undersigned not later than 12 o'clock noon on Saturday, September 22, 1945.

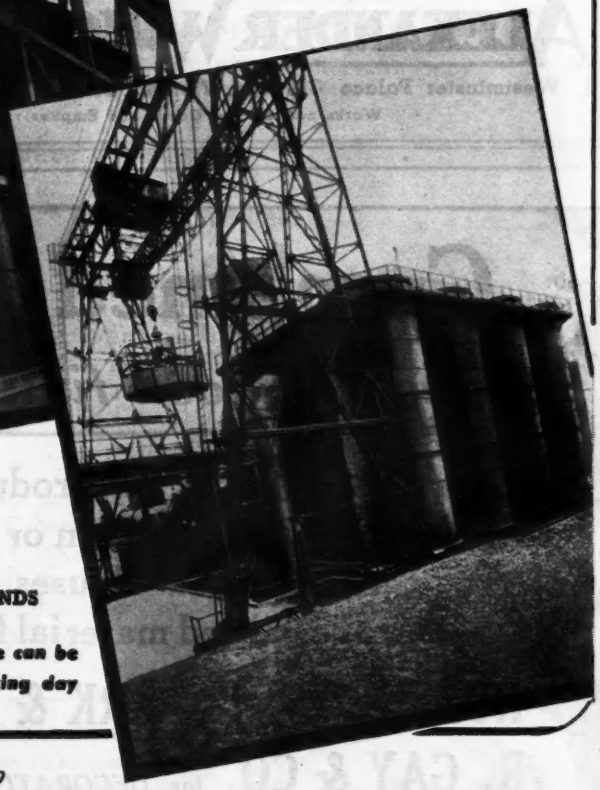
This Advertisement is published by permission of the Ministry of Labour and National Service under the Control of Engagement Order, 1945.

Town Hall, JOHN WALTON,
New Mills. Solicitor and Clerk of the Council.
September 6, 1945.

Get in on the Under Belly of RUST (Engineers' Enemy No.1)
Years of Wear instead of Weeks
GRANT & WEST, LTD
'PHONE NORTH 2160
Steel Wires, Ropes & Cables running in and out of Water, Gas, Sulphurous Fumes, etc. will never RUST if treated with
ROPRES
IT KILLS RUST
STAYS on every STRAND.
RUST KILLS ROPES.—but ROPRES rope preservative KILLS RUST. Use ROPRES
Try a Tin on our Guarantee
3, Furlong Road, London, N.7.
'GRAMS: "SELEKJOINA, HOLWAY, LONDON"

PURIFIERS by

FOUNDED 1850
HOLMES
HUDDERSFIELD



Embody the latest principles which have been well established in plants in England and abroad. The illustrations are of Tower Purifiers with complete mechanical equipment, one in England and the other on the Continent, each purifying gas to town gas standards.

Advantages include:—
SMALL GROUND SPACE
QUICK CHANGE OF BOXES
NO ABNORMAL LABOUR DEMANDS
MAXIMUM FOULING
One box holding 300 tons of oxide can be emptied and refilled in one working day by 3 men.

Write for further particulars to

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LONDON OFFICE • 119 VICTORIA ST. S.W.1 • MIDLANDS OFFICE • 21, BENNETTS HILL, BIRMINGHAM 2
Telephones: Huddersfield, 5280 : LONDON, Victoria, 9971 : BIRMINGHAM, Midland, 6830

C 236

Simmance Patent

"DEAD-BEAT"

PORTABLE RECORDERS

offer Gas Engineers and Distribution Engineers a wide choice of range and pattern . . . three using disc charts and two using drum charts. A hundred and fifty-four different chart ranges are stocked, covering low and high pressures.

Illustrated: "Saxon" *Portable DBR.941, enamelled metal case.*

ALEXANDER WRIGHT & CO LTD

1, Westminster Palace Gardens, Victoria Street, WESTMINSTER, S.W.1.

Telephone: ABBey 2207.

Telegrams: Precision, Sowest, London.

Works address (for Goods and Empties): 28, High Street, Tooting, S.W.17.

Combined 'Ops'...

means a good finish to any job!

For all users of paint products for preservation, decoration or 'sales appeal' . . . the combined Houses of CLARK-GAY have a specialised material for *your* purpose.

ROB! INGHAM CLARK & CO. *for* ***INDUSTRIAL*** FINISHES

R. GAY & CO. *for* ***DECORATIVE*** MATERIALS ——

"A Coating for any surface or purpose!"

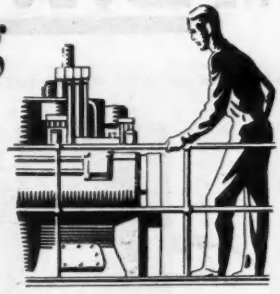
ROB! INGHAM CLARK & Co. and R. GAY & Co.

WITLEY COURT, WITLEY, SURREY (WORMLEY 280-4)
and at 6 ARLINGTON ST., LONDON, S.W.1 (REGent 0881)

Associated with:
ROB! INGHAM CLARK & Co. (Scotland) Ltd., BRITANNIA WKS., RENFREW

INFRA-RED
Let us help you with advice on this process

Better ways of using OIL FUEL



Practical guides to economy

IF YOU USE Liquid fuel you will welcome suggestions that will make it possible to get more work out of every gallon consumed.

Whether you use petroleum fuel, gas or diesel oils, creosote or creosote/pitch mixture, you have at your disposal expert advice on how to reduce losses and wastage and improve the operational efficiency of your plant.

The advice is given in these three Bulletins :

THE INDUSTRIAL USE OF LIQUID FUEL (*Bulletin No.* 24)

A valuable reference to the correct fluidity of various fuel oils at the point of usage ; to the care of burners and the effective control of combustion ; the recovery of waste heat from furnace flue gases ; better furnace loading.

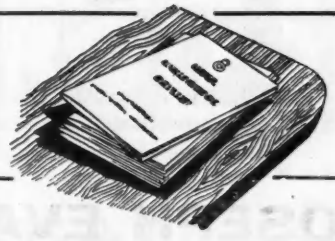
HEAVY-OIL ENGINES (*Bulletin No.* 23)

The facts you need to know about efficient engine operation, easily and quickly grasped. The Bulletin includes a useful rota for cleaning and overhauls, the specimen daily and weekly log sheets (essential to economical operation).

CREOSOTE/PITCH MIXTURE (*Bulletin No.* 36)

Besides technical data (in easy-to-follow form) there are well-illustrated descriptions of efficient C/P systems and practical points on proper combustion. Operational difficulties are listed and the answers given.

MANAGING EXECUTIVES as well as operatives will be well rewarded by a study of these Bulletins. They point the way to substantial oil economies, and improved working. The Bulletins are free from your Regional Office of the Ministry of Fuel and Power.



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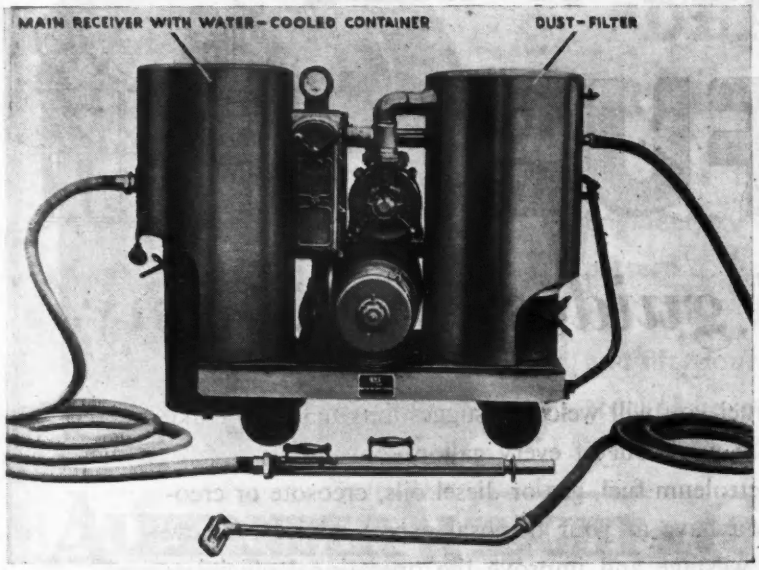

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FIG. 57A. IRON CAST LIFT PUMP.

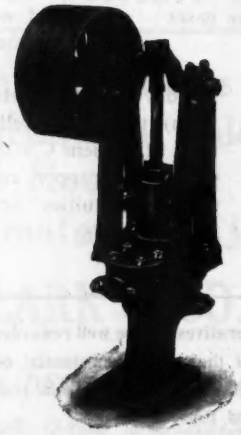

FIG. 257. BELT DRIVEN SINGLE GUIDED RAM PUMP, FOR 60 LBS. PER SQ. INCH.

FIG. 62. GALV. SHEET STEEL LIFT PUMP

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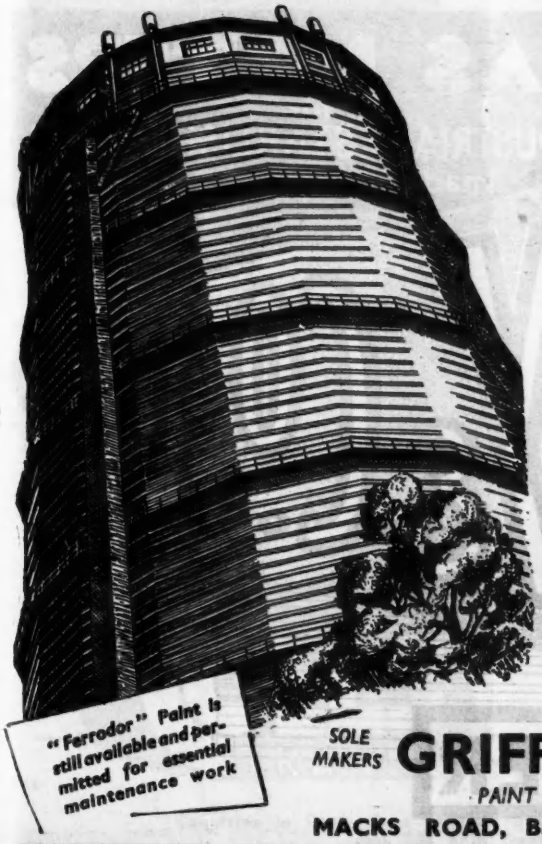

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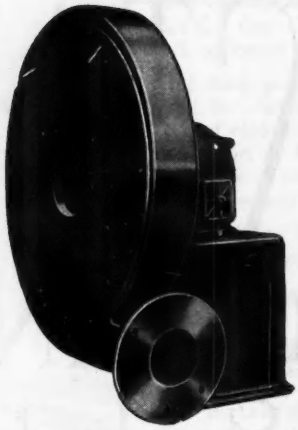

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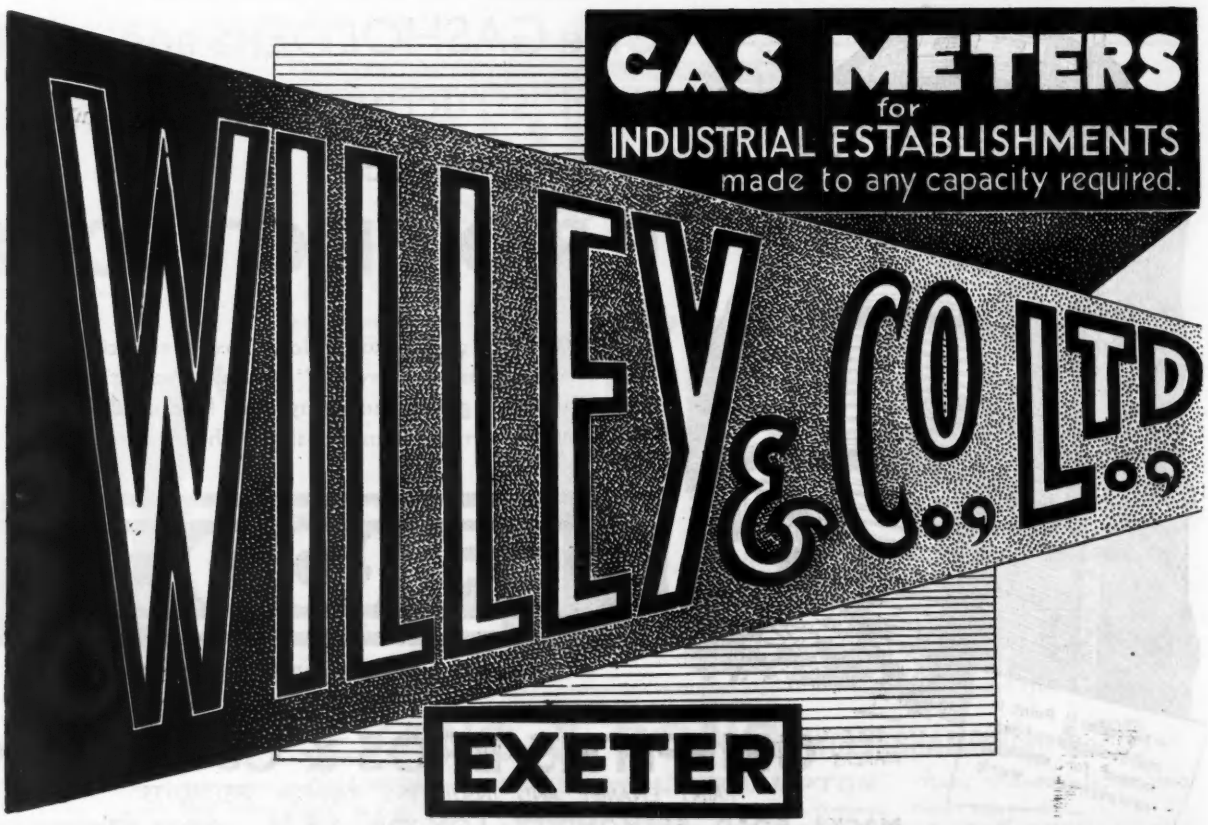

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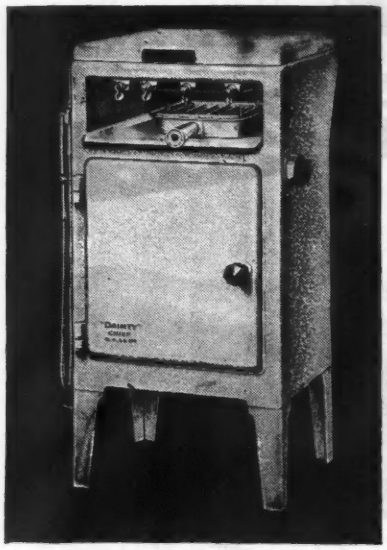

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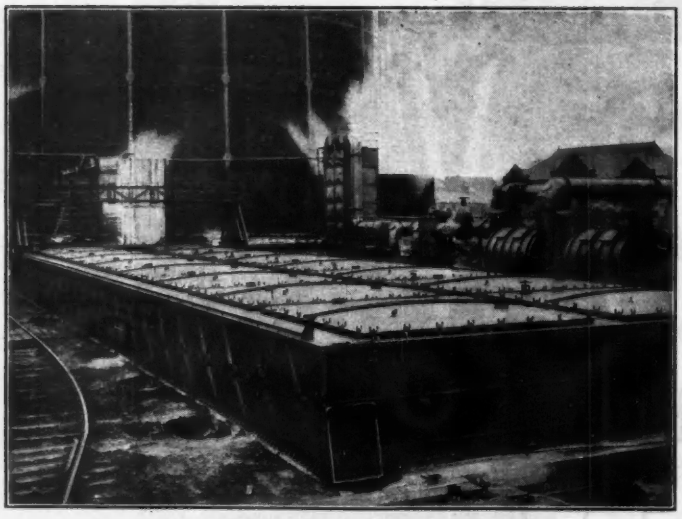

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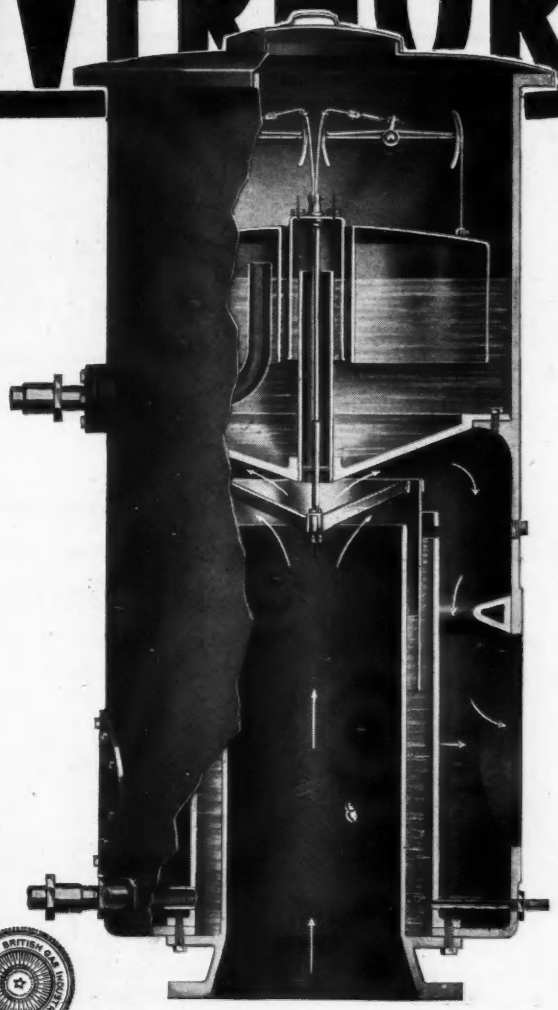

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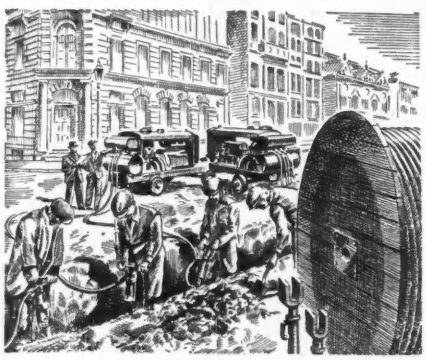

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